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A Cytological and Cytochemical Study of X-Irradiated Human Testes*

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(With fifteen illustrations)

INTEREST in the effect of x-irradiation upon the human testis has long existed. Information concerning doses likely to produce permanent sterility due to complete damage to the germinal tissue, the levels of irradiation causing temporary sterility and the number of mutations present in the inherited material within each germ cell is slowly being amassed. These data are of vital importance to our understanding whenever man risks exposure by the increased use of radiations in industry, research, diagnosis, therapy, or defense.

Observations on human material to date are few and the use of controls has been inadequate. Such observations as do appear indicate that doses of the order of 900 r do not suppress spermatogenesis even four weeks after x-irradiation.[6] Complete termination was not firmly established nor was recovery, since examination would be necessary for many months after such a dose. Changes as have been reported in x-irradiated testes include such effects as cytoplasmic swelling, fuzziness of the nuclei, degeneration of certain spermatogenic cells, and granulation and waviness of the basement membrane. Sertoli cells have been described as disintegrating after 1200 r, and vacuolation and turbidity produced in Leydig cells[4] although greater doses in mice have not been known to cause noticeable effects in these cells.[5]

It was not until 1952 that a careful cytochemical investigation was carried out by Montagna[16] on an extensive male population to determine the normal cytochemical distribution in the human testis of such substances as lipids, glycogen, and phosphatases. Now an investigation on a broad level has been made to describe both the cytological and cytochemical effects induced by an acute dose of irradiation to the human testes. Several of the tests employed by Montagna have been used in this study as well as others thought likely to reveal radiation changes. These studies have indicated that in many ways the x-irradiated human testis does not markedly deviate histochemically from an unirradiated one after periods up to ten days following x-irradiation, although four or five specific tests may detect significant short range changes in the level of metabolic substances present, following a heavy dose of x-rays.

MATERIALS AND METHODS

The subjects used for this study were men between the ages of 57 and 81 years who

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were found to have prostatic cancer. Since the course of treatment to be followed included bilateral orchiectomy, intervals prior to the operation were chosen for the delivery of a dose of 1200 r to one or a portion of one testicle. Nineteen men were included in the study; fifteen had 1200 r to the right testis in one treatment using a 250 KV constant potential x-ray machine while the four others were irradiated with a 22.5 mev Betatron. The irradiation factors for each patient are listed in Table 1. During the course of the irradiation with the 250 KV x-ray machine, the remainder of the scrotum, including the left testis, was lead shielded (⅛ inch Pb) as was the exit surface. The amount of backscatter received by the control left testis was in the range of not more than 8 to 10% of the total dose administered or a maximum of 100 r.

The four patients irradiated with the Betatron also received 1200 r, although one man received this dose to the entire right testis. A second man received the same dose to ⅔ of the right testis, the third had this dose delivered to the lower third of both testis, and the fourth man the same dose to the lower ½ of the left testis. The lower portion of the testis was always chosen for irradiation since minimal or no irradiation of the thigh would occur this way and secondly because the upper portion of the testis is composed of the rete testis and efferent ductules. Thus when the Betatron was employed and only a portion of a testis x-irradiated, the distal portion of the unirradiated remainder served as an adequate control since scatter is much less of a factor in Betatron exposures. However, in the case which had the entire right testis irradiated, using the Betatron, the left testis had received absolutely no scatter.

Various intervals were chosen between the time of irradiation and the orchiectomy. From Table 1 it can be seen that the intervals ranged from 3½ hours (one patient), 5 hours (one patient), 17-24 hours (six patients), 2 days (two patients), 3 days (one patient), 5 days (seven patients), to 10 days (one patient).

The case histories of all patients involved in the study were read after all slides had been examined in order to avoid the possibility of preconceived notions affecting the examination. The purpose was to determine if any factors influencing the histology, other than x-irradiation, had been imposed on the testis. For this reason we have listed, under general remarks in Table 1, such factors as disease and estrogen consumption which may have also produced histological changes in the testis of the subjects involved.

The testes were usually obtained immediately upon removal from the host. Portions of the irradiated and control sections were quickly dissected and placed in the fixatives without delay.

Fourteen methods for cytological and histochemical study were applied to the samples obtained. The fixative, method followed, substance detected and reference are listed in Table 2. Not all procedures have been carried out on every specimen since new and different techniques were added or exchanged for others in the hope that further organic substances could be observed, or shown to be more reliable or more specific and thus help to characterize irradiation-induced changes in this tissue. From the table presented, it should be quite evident that there are classes of metabolic substances for which we have not tested. The choice of technique was always restricted as paraffin sections impose severe limitations upon enzyme, fat and protein detection. Attempts were made to employ frozen sections but the uniformity between sections on the same slide was not sufficiently good for comparative intensity studies.

To evaluate the results of this study, both gross and microscopic examination was made of the material. In all instances both unirradiated control and x-irradiated testis sections were on the same slide and thus run through the technical procedures and treated exactly alike. This ruled out any differences due to technique between the control and irradiated sample. Secondly, several slides were prepared for each procedure, so that sampling could be made through various

TABLE 1

COMPOSITE RECORD OF TESTES IRRADIATION DATA

Patient	Age	Source of Irradiation	Irradiated Area	Interval*	Irrad. Factors	General Remarks
1	64	X-ray	R. Testis	5 days	250 KV, 18 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	
2	66	X-ray	R. Testis	5 days	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	
3	82	X-ray	R. Testis	5 days	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	
4	59	X-ray	R. Testis	5 days	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	Stilbestrol 15 days prior to orchiectomy
5	69	X-ray	R. Testis	5 days	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	
6	75	X-ray	R. Testis	1 day	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	
7	78	X-ray	R. Testis	1 day	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	Diabetes mellitus
8	61	X-ray	R. Testis	5 days	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	Extreme atrophy of both testes
9	73	X-ray	R. Testis	2 days	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	Stilbestrol 3 mos. prior to orchiectomy
10	75	X-ray	R. Testis	5 hours	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	
11	79	X-ray	R. Testis	3½ hours	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	
12	79	Betatron	R. Testis	5 days	22.5 mev, — TSD 80, — 3 cm. port	
13	74	X-ray	R. Testis	1 day	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	
14	72	X-ray	R. Testis	17 hours	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	
15	70	Betatron	⅓ R. & L. Testis	1 day	22.5 mev, — TSD 80, — 3×6 cm. port	Stilbestrol 2 wks. prior to orchiectomy
16	57	Betatron	⅔ R. Testis	2 days	22.5 mev, — TSD 80, — 3 cm. port	Tertiary syphilis—Stilbestrol 1 week prior to orchiectomy
17	70	X-ray	R. Testis	3 days	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	Anaplastic anaemia
18	81	X-ray	R. Testis	10 days	250 KV, 15 ma, TSD 50, HVL 2 mm Cu, 5 cm. cone	Stilbestrol 2 wks. prior to orchiectomy
19	74	Betatron	½ L. Testis	20 hours	22.5 mev, — TSD 80, — 3×4 cm. port	Stilbestrol 9 days prior to orchiectomy

* Between exposure and fixation of the testes.

TABLE 2

CYTOLOGICAL AND HISTOCHEMICAL PROCEDURES EMPLOYED

Substances to be detected	Stain or Method followed	Fixative used	Reference
Alkaline Phosphatase	Cobalt Nitrate Substrate: Sodium Glycerophosphate	Cold Acetone	Gomori, G. 1939[8]
Acid Phosphatase	Lead Method Lead Nitrate Sodium Glycerophosphate	Cold Acetone	Gomori, G. 1941[9]
Glycogen	Aqueous Periodic Acid Schiff	Cold Alcohol	Gomori, G. 1952[10]
Acid Mucopolysaccharides	Alcian Blue—Feulgen	Cold Alcohol	Histochemistry Course Manual, Kansas City[11]
DNA-RNA	Methyl Green Pyronin Y	Methyl Alcohol	Long, M. E., and Taylor, H. C., 1956[14]
DNA	Feulgen Method Leucofuchsin	Carnoy	Lillie, R.D. 1948,[13] p. 88–89
Basic Proteins	Solochrome Cyanine	Carnoy	Histochemistry Course Manual, Kansas City[11]
Nucleus and Chromosomes	Harris' Haematoxylin	Bouin	Lillie, R. D. 1948,[13] p. 56
Elastic Tissue	Verhoeff	Zenker	Mallory, F. B. 1938[15]
Fibrin and Collagen	Phosphotungstic Acid Haematoxylin	Zenker	Lillie, R. D. 1948,[13] p. 62
Protein-Tyrosine	Millon Reaction	Formalin	Pearse, A. G. E. 1953,[19] p. 414
Protein—SS Groups	Performic Acid Alcian Blue	Formalin	Histochemistry Course Manual, Kansas City[11]
Protein—SH Groups	Ferricyanide Method	Formalin	Pearse, A. G. E. 1953,[19] p. 419
Phospholipids	Sudan Black B	Potassium Dichromate Sublimate	Elftman, H. 1957[7]

depths in the tissue block and the reaction could be found to characterize the entire tissue.

All slides were subjectively analyzed by the senior author for cytological and histological disturbances, cellular damage, and color depth or distribution of granular material which was equated with an increase or decrease in the amount of metabolic substance tested for. Spectrophotometric measurements were not carried out.

To assess differences in light absorption, as is customary in ordinary histological and histochemical work, a semi-quantitative method was employed involving the use of a Color-aid Swatch Book. Quantitative differences were made by comparison with the color plates which were graded from light

to dark as obtained by the particular stain in question. The graded color plates were held at a distance from the microscope such that the colors were superimposed on the binocular field of vision. This technique provided a reasonable degree of standardization and reproducibility in evaluating the intensity of the Feulgen, PAS, Fat, and Alkaline Phosphatase reactions.

The usual measurements in this study were made with an ocular micrometer. However, to obtain an approximate area estimate of the percentage of the tissue which was occupied by seminiferous tubules, intertubular substance or interstitial tissue and space, and fibrotic closed tubules in both control and irradiated sections, a Whipple micrometer was employed. Under low power 10 × magnification and 7.5 × ocular, each of the 100 squares was examined to determine which tissue more than half-filled it. The number of squares in the micrometer is 100, thus allowing one to approximate the percentage of either tissue directly.

Lastly, upon completion of the analysis of the cytological and histochemical changes seen, a copy of the Pathology report for each patient was read. It was of interest to learn (1) if any malignancy or abnormal pathological condition existed, (2) if another portion of the same testis had the same histological picture as seen by us, and (3) if an unsuspecting pathology observer could pick out from H&E sections of both testes, any outstanding features which we would know to be radiation-induced. Each Pathology report was based on the observations made by two Pathologists which meant that two completely unbiased opinions were obtained from this source.

Results

A. *Positive Cytochemical Findings.* Histological and histochemical analysis of the distribution and intensity of alkaline phosphatase revealed that regardless of the age of the patient, the degree of degeneration of the testes, or the interval between the x-irradiation and time of orchiectomy, irradiation caused an increase in the level of alkaline phosphatase present, particularly around the germ cell nuclei and in the interstitial tissue cells (Figs. 3 & 4). Control samples indicate

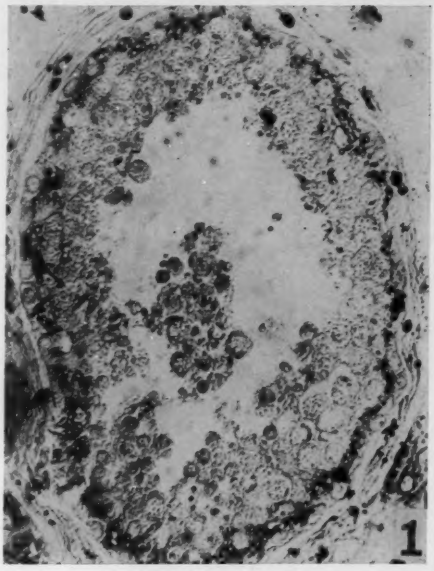

Fig. 1. Control tubule stained for phospholipids. 430×.

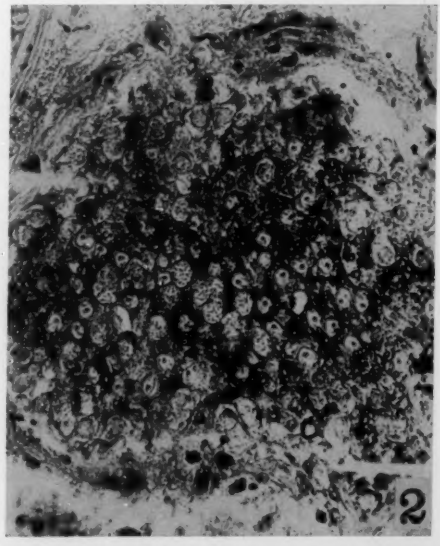

Fig. 2. X-irradiated tubule of same patient (Fig. 1) showing increased amount of phospholipids 5 hours after irradiation. 430×.

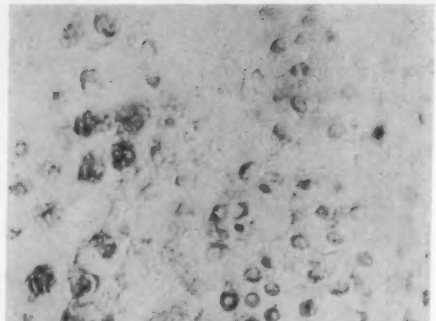

FIG. 3. Control tubule stained for alkaline phosphatase. 430×.

that normally the peripheral germ cells stain weakly while those centrally located stain intensely. In general, a wide range from weak to intense staining characterizes the control testes while the irradiated organ is easily distinguished by its rather narrow range of intense staining activity throughout the majority of the tubules. An increase of alkaline phosphatase was found in 16 out of 19 cases; two cases showed no difference between control and irradiated samples (1 with 24 hour interval and 1 with 10 day interval) and one case (with 3 day interval) was found to have a decrease in intensity on the irradiated side.

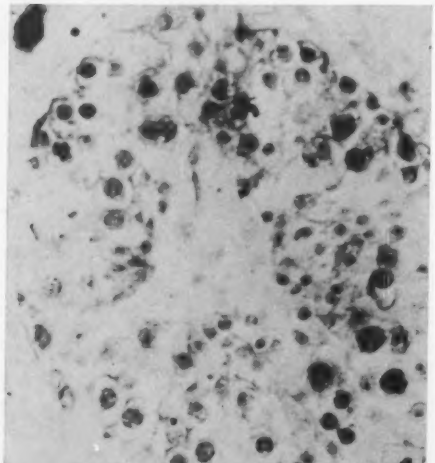

FIG. 4. Irradiated tubule 5 hours after irradiation showing increased alkaline phosphatase staining activity. 430×.

In the case of the Feulgen reaction for the detection of DNA, four instances of a decrease in staining intensity in the irradiated tissue have been seen. This occurred in sections from testes which had been irradiated two days (one case) or five days (three cases) prior to the orchiectomy. Any acute visible diminution in stain could not be seen in the spermatids, spermatozoa, Sertoli cells, or Leydig cells.

An increased amount of glycogen as determined by the PAS technique was found in three cases in which a short interval existed between the irradiation date and the orchiectomy. No difference in intensity occurred between samples at the 3½ hour interval, but the patient with a five hour interval demonstrated a perceptible difference in glycogen concentration as well as did two patients with 24 hour intervals. Great glycogen deposits, accumulation, or residues were found around pyknotic nuclei of germ cells in both control (those receiving 100 r backscatter) and irradiated sides (Fig. 5). In addition, more glycogen droplets were present in the spermatogonia, primary spermatocytes, and Sertoli cells in the irradiated section. These droplets were usually scattered throughout the cytoplasm or accumulated on the periphery of the germ cells, but only the former in Sertoli cells. No increase in intracellular glycogen was seen in testes samples with intervals greater than 24 hours between irradiation and orchiectomy.

In two instances were there found to be an increased amount of phospholipid staining material present in the irradiated sections; these appeared at the five hour level and the ten day interval. At both these time intervals the basement membranes and the cells

lying along them as well as the other cells within the tubules stained darkly (Figs. 1 & 2). It was particularly noticeable that the Sertoli cell processes did not appear to have much phospholipid material and only the basal portion of the cells which contain the nuclear material was heavily stained.

In the realm of protein histochemistry, while no differences were expected, the observer found that often a possible difference in staining intensity using acid Solochrome Cyanine had occurred. That such a difference should arise upon five occasions strengthened the belief that a real difference was noted. The test employed was specific for the basic proteins, particularly the mucins such as hyaluronic acid which are thought to be a component of the basement membrane.[10] Of the ten patients tested with this technique, five did not show any observable difference between irradiated and control testes sections. Basic proteins were demonstrated in the ground substance between the tubules and between the cells within the tubules as well as within the basement membrane and tunica surrounding each tubule. It was found that when differences were to be demonstrated, those differences showed up only when using Carnoy fixed material and not formalin fixed material. The five occasions in which protein differences appeared were intervals up to and including the three day period. At the 3½ hour interval a decrease in staining intensity in the tunica appeared in irradiated sections, at 17-24 hours and two days, an increase occurred, and at three days a decrease was again noted on the irradiated side.

B. *Negative Cytochemical Findings.* The Millon reaction revealed that the epithelial lining of the tubules or the tunica propria contained the hydroxy-phenyl-amino acid, tyrosine. However, irradiation appeared to have no visible effect on this component of the tissue.

No reaction was obtained on either the irradiated or control sections in an attempt to stain for the enzyme acid phosphatase. Three techniques were tried, Mannheim and Seligman,[19] Grogg and Pearse,[19] and Gomori.[9] In no instance was a reaction obtained. This is in agreement with Montagna's results.[16]

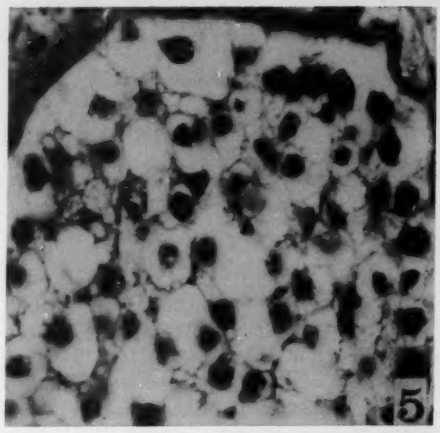

FIG. 5. Portion of irradiated tubule showing "halo" of glycogen around pyknotic nuclei. PAS stain.

An extremely weak reaction was obtained with the Performic Acid Alcian Blue technique for the demonstration of −SS groups. The tunica appeared to stain slightly, but nonetheless would characterize only a small percentage of −SS groups, i.e. less than 4%

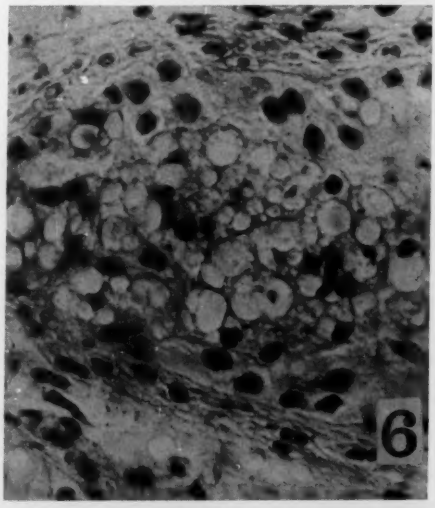

FIG. 6. Irradiated tubule demonstrating the "honeycomb" effect due to lysis of cells 5 days after irradiation. 430×.

cystine. No difference in reaction was noted between control and irradiated samples at any interval between irradiation and date of orchiectomy.

The Ferric Ferricyanide method for the detection of −SH groups as outlined by Chèvremont and Fréderic[19] was carried out, employing paraffin sections. A negative result was obtained in every instance. Pearse[19] warns that a negative result with this technique need not indicate a total absence of −SH and for this reason an azo dye technique as outlined by Barrnett[1] was attempted with the last patient. The end result was the same, no reaction to show the presence of any −SH groupings.

Although no effect of irradiation was manifested in the simple proteins of the connective tissues demonstrated by such techniques as Mallory's Phosphotungstic Acid Hematoxylin Method and Verhoeff's Elastic Tissue Stain, it might be well to describe the histochemical picture obtained from these two procedures. With the Verhoeff's one sees that the tunica propria contains collagenous coarse fibers and the intertubular connective tissue, reticular fibers surrounding the Leydig cells. Mallory's procedure confirms that the tunica is collagenous with coarse elastic fibers sprinkled therein and the amorphous connective tissue between the tubules has both coarse and fine elastic fibers although the latter are in greater abundance.

Acidic carbohydrates, i.e. mucopolysaccharides, are demonstrated by the use of Alcian Blue. These were easily detected in the tunica of all tubules as well as being present in the connective tissue between the tubules. These substances too seemed radioresistant at least on so gross a level.

C. *Morphological and Histological Changes.* The methyl-green pyronin and hematoxylin techniques gave a unique opportunity to carry out various observations. They included answering such questions as: (1) Had an increase in the size of the nucleoli or number of nucleoli of the Sertoli cells occurred after irradiation? (2) Had the width of the epithelial lining of irradiated tubules increased? (3) Had the number of Sertoli cells increased following irradiation? (4) Had irradiation produced an hyperplasia of the interstitial cells? (5) Could one characterize the wave of necrosis which followed a dose of x-rays? (6) Had termination of spermatogenesis occurred? (7) Had radiation caused increased fibrosis?

To answer these questions, conditions were standardized within reasonable limits considering the material at hand. With the aid of an ocular micrometer, tubules of approximately the same size, that is, as nearly as possible, round tubules, 180 μ in diameter were scored. Only slides showing minimal atrophy were chosen when a choice was available. At least 10 tubules were used in every irradiated sample while the control figures cover 3-5 times more data.

The number and size of nucleoli present in irradiated Sertoli cells does not markedly deviate from control figures which averaged 1.8 μ in size and included in number, one large nucleolus and an occasional small one. Two instances of a "bridge" type nucleolus were seen in irradiated material 17 hours after irradiation (Fig. 14).

Ten tubules at various intervals following irradiation were measured at their thickest point to determine the width of the tunica. It was found that the two fold variability in the controls (Table 3) indicated great differences between individuals but no such dramatic difference between testes sampled from the same individual. Thus no measurable or easily demonstrable change in thickness of the tunica was brought about by irradiation during the ten day period. This interval may have been too short for such connective tissue changes.

The mean control value for the number of Sertoli cells present in a 180 μ tubule was found to be 8.7 cells per unirradiated tubule. This figure is based on the values obtained from 54 tubules with values ranging from 6-10 Sertoli cells. No increase in this value was found to occur in our sampling until 17 hours after irradiation. From this period on there is a steady increase with doubling taking place by the fifth day after irradiation (Table 3 and Figs. 7 & 8).

TABLE 3

HISTOLOGICAL CHANGES PRODUCED BY 1200 R TO THE HUMAN TESTIS AT VARYING INTERVALS FOLLOWING X-IRRADIATION

Interval between Irradiation and Orchiectomy	Number of Sertoli Cells per Tubule*	Width of the Tunica*	Number of Necrotic Cells per Tubule*
Control	8.7	9–19 μ (Range)	1.2
3½ hours	8.5	—	4.6
5 hours	9	19 μ	7.5
17 hours	12	—	4.3
24 hours	12	13 μ	4.4
2 days	13	—	2.2
3 days	15	11 μ	3.5
5 days	16	18 μ	3.3
10 days	18	16 μ	2.7

* These figures represent an average obtained from at least ten tubules approximately 180 μ in diameter.

Concerning the period during which maximum necrosis occurred, the number of necrotic cells in these same ten tubules was recorded. It was found that the number of dead or dying cells increased rapidly after irradiation, with peak values at 5 hours after the irradiation period. This steep rise may continue to a greater maximum between 5 and 17 hours after irradiation, but lack of material or sampling during this period leaves this point unanswered. At 17 hours, the level of necrosis is greatly reduced, with only a slight reduction occurring from 2 days onward. At 10 days after irradiation, necrosis on a level greater than control values (approximately 1 cell/tubule) is still in progress (Table 3).

The question concerning termination of spermatogenesis with a heavy or acute dose of x-rays cannot be fully answered since periods beyond 10 days were not available. However, complete cessation had not been accomplished with the 10 day period studied even with 1200 r x-rays. Visibly "normal" meiotic prophases in a few tubules were still seen (Fig. 15), as well as an occasional spermatogonium which had not yet lysed or become pyknotic. Unfortunately the material for the ten day sample was obtained from an eighty year old patient with moderately atrophic testes, so only limited information can be derived from this source.

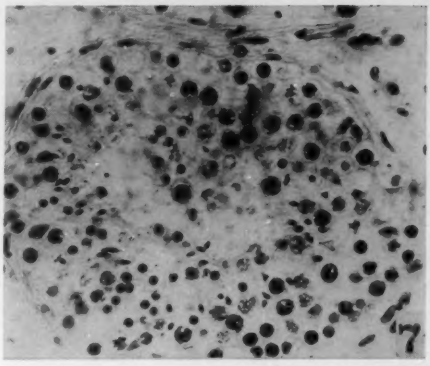

FIG. 7. A control tubule about the same size and stage as Fig. 8 with approximately eight Sertoli cells present.

With the use of the Whipple micrometer, approximate area estimates made it possible to obtain values for the percentage of active tubules, completely fibrotic remnants of tubules, and interstitial tissue occupied by each. Of the seven patients examined with intervals of 5 days or more between irradiation and orchiectomy, six demonstrated an increase in the percentage of fibrotic tubular material present and only one showed no fibrosis in either irradiated or control material, that is, no change (Table 4).

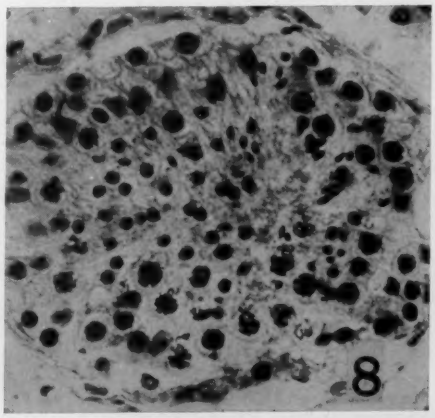

FIG. 8. A tubule of same patient (Fig. 7) 5 days after irradiation showing doubling of Sertoli cell numbers.

TABLE 4

PERCENTAGE FIBROSIS AND INTERSTITIAL MATERIAL PRESENT IN TESTIS WITH 5 DAY INTERVAL OR LONGER BETWEEN 1200 R X-IRRADIATION AND ORCHIECTOMY

Patient	Percentage Fibrosis		Percentage Interstitial Material	
	Control	Irradiated	Control	Irradiated
3	3	17	17	43
8	5	42	33	34
1	0	3	16	43
5	0	15	37	59
12	2	16	22	28
4	0	0	26	28
18	0	8	38	14

The possibility of hyperplasia of the interstitial substance was considered. Again, the values obtained from the use of the Whipple micrometer indicate that no consistent pattern can be discerned. Of the same 7 patients with intervals of 5 days or greater, four show no appreciable difference in the percentage of interstitial material, in fact one of the four shows less interstitial material in the irradiated testis. The other three were found to have increased interstitial substance amounting to at least a fifty percent gain (Table 4). A unique example of the increased amount of interstitial material found in one irradiated testis as compared with the control testis is presented in Figures 9 and 10.

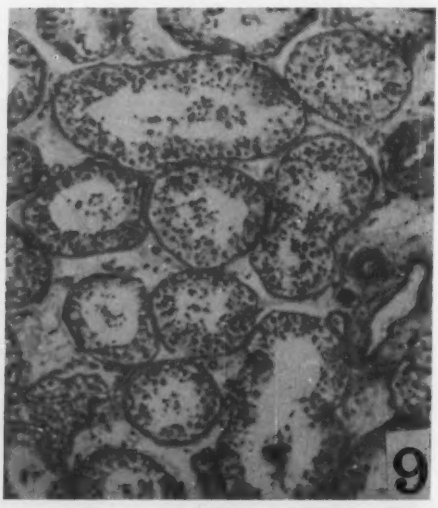

FIG. 9. Tubules and interstitial material in unirradiated testis of patient with 5 day interval between irradiation and orchiectomy. 100×.

FIG. 10. Tubules and increased amount of interstitial material found in the irradiated testis of same patient (Fig. 9). 100×.

D. *Cytological Findings.* The cytological effect of radiation upon mammalian chromosomes in tissue culture has been described by Bender.[3] It is of interest nevertheless to mention certain abnormalities which are present *in vivo* after irradiation. These latter forms of damage fall into the category of being cell divisions terminating in death due to chromosome damage. One finds fragmentation as well as clumping of the chromosomes, cells in which spindle formation is absent, arrested or blocked metaphases (Fig. 13), dumbbell shaped anaphases due to bridge formation, and cells in which the chromosomes have undergone despiralization (Fig. 12). A few instances of polyploid giant type cells (Fig. 11) were seen, particularly in the material with a 5 and 10 day interval between irradiation and orchiectomy.

E. *Pathology Data.* Information obtained

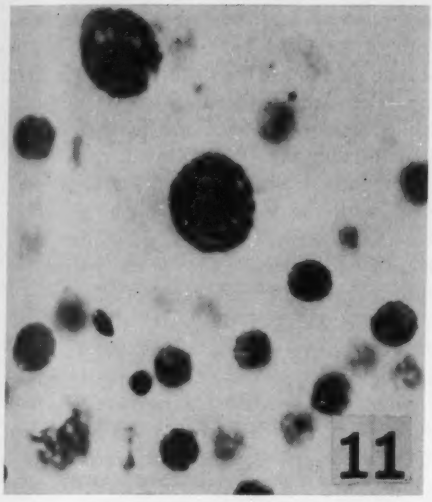

FIG. 11. Giant cell present in tubule 5 days after irradiation.

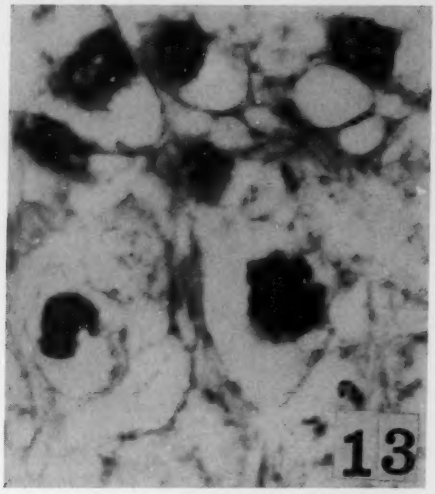

FIG. 13. A blocked meiotic metaphase seen 24 hours after irradiation.

by examination of the Pathology reports revealed that in four of the sixteen cases irradiated with the 250 KV machine, the examiners noticed some difference between testes. It must be kept in mind that in each instance it was the right testicle which was irradiated. One patient with a 5 day interval between irradiation and orchiectomy was described as showing the usual senile changes in the left testis, tubules lacking in germinal cells, tubules filled with Sertoli cells, slight degree of fibrosis, etc. However, "changes seem to be slightly more prominent on right testicle."

Another case, again with a 5 day interval, was described as having decreased spermato-

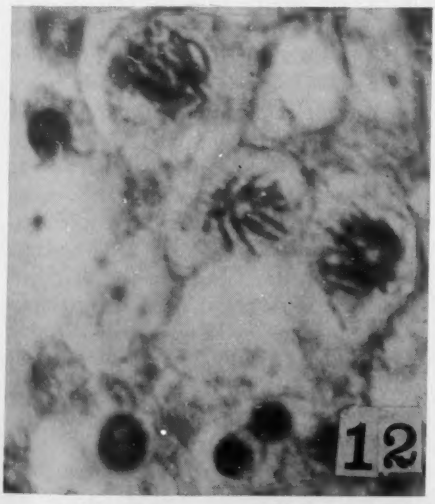

FIG. 12. Despiralization of chromosomes at first meiotic anaphase seen 24 hours after irradiation. H&E stain. 970×.

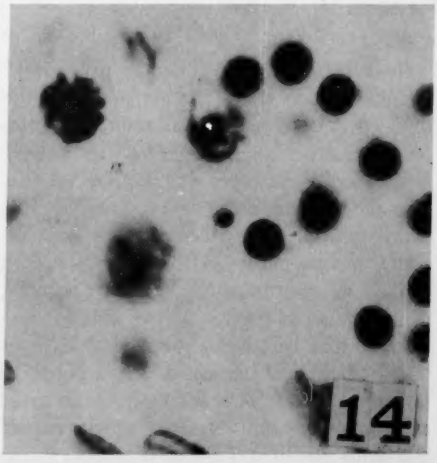

FIG. 14. A dumbbell shaped nucleolus, a possible nucleolus bridge, in a Sertoli cell 17 hours after irradiation.

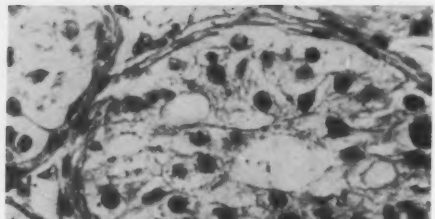

FIG. 15. Cell divisions present in a tubule from an 81-year old testis ten days after irradiation.

genesis in the left testis while the right demonstrated "little spermatogenesis with few Sertoli cells." Still another five day sample was described as showing one testis with some tubular structures present but much fibrosis while the other had less testicular tissue. The patient with the 3½ hour interval was described as having Sertoli cells present in the right testis which showed "hyperchromatic nuclei with aggregates of chromatin material."

DISCUSSION

General Remarks. While the practice of irradiating one testis to compare with the shielded one seemed a reasonable measure, several facts came to light as the project progressed. First there was the obvious fact that the control testis using the 250 KV x-ray machine was receiving some backscatter amounting to 8-10% of the total dose applied or approximately 100 r. Secondly, in the course of examining the slides, it was thought that certain morphological changes noted might not be entirely attributed to radiation effects. That is, the question arose as to whether both testes age synchronously and until evidence could be presented showing that the regulatory mechanism in aging males does cause the simultaneous decline of both organs, doubt would be cast on certain observations as being truly associated with or produced by x-irradiation. Thus it was decided to use the Betatron and irradiate a part of each or just a portion of one testis while shielding the remaining portion or portions of the same testis. Thus a control anterior portion and irradiated posterior portion of the same testis would be provided for examination. In this way too, the problem of backscatter to the control portion of the testes would be eliminated.

On the basis of this rationale, four patients were treated on the Betatron, three having only a portion of one testis or a portion of both irradiated. Unfortunately only three intervals (1, 2, and 5 days) between irradiation and orchiectomy could be obtained. But for the intervals studied, none were found to show marked deviations from the conclusions drawn from the 250 KV irradiated material. For this reason, all data obtained both from x-ray and Betatron have been pooled.

Information concerning the inadequacy of using one testis as a control against the other was provided by Roosen-Runge, et al.[21] who indicated that 10 out of 42 cases of simultaneous bilateral biopsy proved to have one testis which differed from the other to such a degree as to be termed "abnormal." Of the 19 cases studied by us, three (two 5 day and one 24 hour interval) showed more marked atrophy or histological changes in one testicle than in the other. With these facts in mind as a basis for the study, it was thought that with reasonable assurance one could conclude which effects were attributable to x-irradiation as distinct from senility.

No photometric measurements were carried out in this study, thus only those histochemical findings which were drastic quantitative changes could be noted. While only occasional dramatic differences were observed, some knowledge of the radiation character of the substances present in the aging testis have been made known. However, the source of the testicular tissue for this study, prostatic cancer patients, must be kept in mind to avoid unreserved extrapolation to "normal" human male adults sub-

jected to irradiation. As Begg[2] points out in his article on "Tumor—Host Relations," a few instances have shown that biochemical and morphological changes can be produced by neoplasms in tissues distant to, and free of tumor.

There are a host of factors other than the presence of a tumor which may produce a change in the histological picture of the testis. Sohval[23] covers this point in great detail, but to mention just a few pertinent factors: drugs or estrogen therapy, malnutrition, diabetes, temperature, and ductal obstruction. It was with this knowledge in mind that the case history of each patient was investigated. Under general remarks in Table 1 are listed then those factors found other than irradiation which may have altered or affected the histological picture.

Specific Remarks. The solochrome cyanine results are very much in keeping with the cyclic changes noted in other biochemical systems following irradiation of proteins. Increased activity has been noted immediately following irradiation and then a depression in the synthesis of a protein such as hemoglobin.[18] However, we have noted a short period of basic protein depression a few hours after irradiation, then an increase followed by a decrease at three days, indicating again, the extremely complex cyclic changes occurring at various intervals following irradiation. "Recovery" (return to the cytochemical state of the control testis) was found to have occurred by a period of five days after irradiation.

The enhanced alkaline phosphatase activity of the testis observed following irradiation has also been reported in the spleen and thymus following high doses of x-rays administered to mice and rats.[20] In the testis material, this has been found to be the most reliable cytochemical test which can be used to distinguish the irradiated and the control sample. Petersen and DuBois[20] postulate increased activity or a great change in phosphatase activity in tissues highly sensitive to injury by ionizing radiations. Certainly the testis would fall into this category.

Increase in the quantity of phospholipids and glycogen was found only in short periods following irradiation, indicating only temporary alterations of the levels of these substances. Great accumulation of fat in cells bordering on the basement membrane was found at 5 hours, the peak or period of high necrosis, when spermatogenesis was severely impaired and a reduced drain on the supply of phospholipids was doubtless occurring. So too the "halo" effect of increased glycogen around pyknotic nuclei seen between 5 hours and 24 hours can probably be looked upon as an accumulation or storage due to lack of use rather than increased phospholipid production.

The marked decrease in Feulgen intensity in the irradiated sections at intervals of 5 days between irradiation and orchiectomy can be explained in two ways: either the decrease in the number of spermatagonia and primary spermatocytes through cell death on the irradiated side would account for the loss of stain or a very real reduction in DNA activity among the germ cells has taken place in the irradiated tissue.[12] It has not been possible with this material to settle this point by cell counts of round tubules the same size and stage of spermatogenesis, so that spectrophotometric measurements would be necessary.

It is of interest to note that Shaver[24] applied some histochemical methods to irradiated rat testes. After 500 r, no change in lipid distribution was found nor any striking change in the DNA, lipoprotein, glycogen, and mucopolysaccharides within the cells of this tissue. Unfortunately he does not mention when he sampled his material for these observations. In any case, it would appear that some constituents of these cells are not considerably damaged by radiation *in vivo*, particularly as only a very small percentage of the substances involved would be affected by so small a dose of x-rays and therefore remain undetected by such semi-quantitative methods.

In agreement with Montagna,[16] no trace of acid phosphatase was found in the human testes material. However, while no reaction was obtained for SH compounds either,

Barrnett[1] has described a positive reaction with the male rat genital system. A moderate reaction was seen in the epithelial lining of the rat tubules and a strong reaction in the cells lining the lumina of the tubules particularly the spermatozoa.

Bryan and Gowan[5] record Sertoli cell increases in two strains of mice after 2560 r. In one strain a level 2.5 times the control was reached in 5 days and a decrease to 2 times the control value by 10 days. In the other strain 5 times the level was reached in 5 days and 2.2 times at 10 days. The observations made here on human testes are that Sertoli cell population has increased 2 fold by a 5 day period following irradiation. This is not easily explained when one considers that no Sertoli cell has been seen in division in all the testis material examined. One can only postulate that with decreased germ cell numbers and increased Sertoli cell numbers, one of two things or both must be occurring: (1) Immature forms of Sertoli cells formerly sandwiched between germ cells may undergo readjustment or enlargement of the cytoplasmic extensions and nuclei by enhanced metabolic activity, or (2) A gradual reduction in the size of each tubule may simply force the original number of Sertoli cells into a smaller area. Nebel[17] explains the excess of Sertoli cells not by division, or shrinkage of tubules, but by the occurrence of a corresponding number of restitution cells formed from blocked first metaphases which he calls pseudo-Sertoli cells. As mentioned in the results, Sertoli counts were made on methyl-green pyronin stained slides which reveal DNA and RNA. Sertoli cells stand out unmistakably with their large ovoid nuclei containing a distinct large nucleolus and very little chromatin material. It is not thought possible to confuse a blocked metaphase which is minus a nucleolus at that stage and full of large chromatic bodies with a true Sertoli cell. The explanation put forth by Nebel cannot be accepted on the mere basis of a coincidence of numbers.

Although the Sertoli cells of the testis are considered to be relatively radioresistant, a few changes were noted in the nucleolus-forming apparatus, particularly 17 hours after irradiation. Some Sertoli cells were seen to have several small nucleoli instead of one large and possibly one additional small one, and one or two cases of a sticky nucleolar bridge were found. Deviations in form, size and number of nucleoli following a dose of 800 r to spleen and bone marrow cells have been reported by Sherer.[22]

The period of great necrosis was found to be in material observed five hours after irradiation but unfortunately no material between 5 and 17 hours was obtained. The degree of necrosis at 3½ and 17 hours was found to be approximately the same. Bryan and Gowan[5] found the peak of necrosis in mice to be 8 hours after irradiation regardless of whether the dose was 320 r or 2560 r to the testis. At five hours after irradiation of the human testis with 1200 r, the frequency of necrotic cells is four times that found in control material. It is noteworthy that necrosis is still seen at a level higher than control figures even at periods up to ten days following irradiation. Thus cells containing delayed lethal damage and doubtless those cells attempting division are found to be dying at periods of ten days after irradiation injury.

Certain observations were not always borne out by measurements of the few cases at later intervals. These included effects which might be termed as hastening of senescence, i.e. narrowing of the tubules, increased degree of fibrosis, and increased width of the tunica. Increased fibrosis does occur in almost all irradiated material (except one case with a 5 day interval or more). Although the magnitude of this increase varied considerably from patient to patient, the effect was consistent. It might be argued that this again may be merely a difference between testes of the same individual but if this is not an irradiation induced change, it seems exceedingly strange that in each instance the irradiated testis became more fibrotic than the control.

Concerning the case histories, it may be noted that in only 25% (4 out of 16 in

which one testis was irradiated and the other shielded) of the cases did the Pathology report indicate any noticeable difference between irradiated and control testes. In all cases, the testis seen to have the more drastic changes was always found to be the irradiated right one. It is doubtful whether the examiners were aware that either testis had been irradiated. Three of the four cases spotted were long term intervals, from which it may be concluded that early induced changes are less dramatic and harder to pick out in simple H&E stained material, especially in senile testes slides.

Summary

1. The cytological and cytochemical changes induced by exposure of human testis to 1200 r of x-rays at various intervals up to ten days following irradiation are discussed. Material was obtained from 19 prostatic cancer patients between the ages of 57 and 81 years.

2. Fourteen cytochemical tests were applied to the material obtained. The effects noted were:

a. With the exception of 3 cases, alkaline phosphatase activity was found to increase regardless of the interval between irradiation and orchiectomy.

b. A decrease in Feulgen stain was found in four cases with intervals of 2 and 5 days.

c. Both phospholipid and glycogen increases were seen after short intervals.

d. Basic protein were found to undergo a cyclic change with time following irradiation.

3. Morphological and histological changes seen include:

a. There is an increase in the number of Sertoli cells with a doubling by 5 days after irradiation.

b. A maximum level of necrosis occurs between 5 and 17 hours following irradiation.

4. Certain senescent changes were described as having been hastened by irradiation; these include narrowing of tubules, thickening of the tunica and increased tubular fibrosis.

5. Evidence supporting these conclusions is presented as well as data of a cytochemical and histological nature.

Acknowledgments

The authors gratefully wish to acknowledge Drs. J. P. Latimer and A. Dean of the Department of Urology who made it possible for us to obtain the testes material. Our sincere thanks also to Dr. Nora Tapley and her associates of the Department of Radiology who were in charge of the irradiation procedures and Mrs. Reilly who informed us when each case became available. We are also indebted to Miss Ann Davis for her technical assistance.

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"I believe in the spirit of peace, and in sole and absolute reliance on truth and the application of it to the hearts and consciences of the people. I do not believe that the weapons of liberty ever have been, or can be, the weapons of despotism. I know that those of despotism are the sword, the revolver, the cannon, the bombshell; and therefore, the weapons to which tyrants cling and upon which they depend are not the weapons for me, as a friend of liberty."—W. L. Garrison.

The Impact of Radiological Fallout on Medical Operations*

By

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THE Commander of today is faced with many problems which Commanders of former years never dreamed would exist. New tactics, new techniques and new tools are the order of the day. The entirely new tool that the Commander has at his disposal is the nuclear weapon. New tactics and new techniques of land warfare have been devised for offensive and defensive combat in areas many times larger than similar areas in former wars. This has a great impact upon the medical service. However, we in the medical service must be ready to care for the sick and wounded as we have done in the past.

NEED TO BE INFORMED

The problem for discussion here is the impact upon medical service when required to operate in an area which is covered with a blanket of ionizing radiation originating from radioactive fallout. The Medical Commander must be fully informed of the hazards so that he can take precautions to protect his own command and at the same time consult with and inform commanders of other units of possible hazards and means of protecting his troops. He must know the nature of the hazard, the significance of radioactive decay upon his operations and the medical effects of radiation on the troops.

In a nuclear war there are three ways in which radiation can be delivered, although only one of these ways is tactically important. These three are: (1) prompt, or the initial radiation from a weapon which is (by definition) over within one minute, (2) close-in and early fallout, and (3) late long-term fallout, the latter being the least important on the battlefield. If an individual is in the vicinity of a nuclear weapon at detonation, he will be exposed to a level of radiation which depends upon his proximity and orientation to the detonation. He may be in the open, he may be shielded in a fox-hole, he may be shielded in a tank or he may be occupying a building at the moment of detonation. The heat and blast may be the overwhelming factors if troops are caught in the open or in a poorly shielded situation, although almost any kind of protection will cut down the number of casualties from the blast and heat. On the other hand these same shields may be of very little value from the initial radiation which is primarily gamma radiation and neutrons. The latter are very difficult to shield against within three-quarters of a mile from the detonation of a nominal weapon (slightly farther from a larger weapon). Gamma radiation is more easily shielded by the same thickness of material. Gamma radiation is similar in characteristics to x-rays. Thus there is little that can be done for protection from the initial radiation after the detonation.

FALLOUT

The long-term fallout so widely discussed in the public press is of little consequence to the outcome of the battle. The radiation is there and is of harm over a long term, but the close-in early fallout is the determining factor. Close-in early fallout is that which falls in the first 12 hours and blankets an area of from 20 to 200 miles from the point of detonation, depending upon the yield of the weapon and the wind structure. For discussion the emphasis will

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be on the parameters which affect fallout and what can be done to protect troops from the harmful effects of the radiation. CASUALTIES FROM FALLOUT ARE NEARLY ALL PREVENTABLE. To prevent these casualties, we must protect ourselves.

What Are the Requirements?

The parameters which affect fallout are: (1) the height of burst, (2) the yield of the weapons, (3) the terrain over which the detonation occurred, and (4) the winds at all altitudes of the atomic cloud. The detonation must be a surface burst for fallout to occur. The yield of the weapon determines the area covered by the fallout particles coming from the cloud as it goes overhead. The fraction of the total energy obtained from the fissioning process determines the amount of radioactive fission products available to form radioactive particles. A clean weapon is one in which a large percentage of the total energy is obtained from the fusion reaction in the thermonuclear weapon rather than from the fission reaction. Then by whatever mechanism the radioactive fission products become trapped in the soil particles and fall to the earth, the hazard is from the gamma radiation of the artificial radioactive isotopes within the fallout particles. The particles which come into actual contact with the skin may cause beta burns, although brushing off the skin will protect almost entirely from this hazard. Clothing protects from possible beta damage, but gives little or no protection from the gamma radiation. The neutrons are gone by one minute after the detonation and are not considered except for the possible hazard from the induced radioactive materials by interaction of neutrons with the terrain materials such as sodium or silicon in the soil.

The atomic cloud rises rapidly after the fireball reaches its maximum diameter. The maximum altitude attained by the cloud depends upon the yield of the weapon. If the detonation is 100 kilotons or larger, a portion of the cloud may reach the stratosphere and by and large, the radioactivity therein falls slowly and world-wide. This slow fallout is not a battle-field problem. However, the portion of the cloud in the troposphere is the portion of the cloud from which fallout originates. The tropopause, or the temperature inversion layer at about 25,000 to 50,000 feet, is the layer which separates the stratosphere from the troposphere. For the most part fallout comes from the portion of the cloud which is in the troposphere.

Fission Products

At the instant of denotation radioactive decay begins. The uranium or plutonium atoms are split to form two atoms of lower atomic weight, both of which are radioactive. The fission products are a mixture of about 35 elements consisting of about 200 different radioactive isotopes. The radioactive decay of this mixture is more or less constant for all detonations. From studies of radioactive decay in the many detonations in the field tests (and laboratory investigations under carefully controlled conditions) evidence indicates that in decay, for every factor of seven increase in time after the detonation, there is a factor of ten decrease in the intensity of radiation. This is very important if troops are to protect themselves. It means that troops must find and use good protection in the early hours after detonation. Put another way, troops can receive as much as 50 per cent as much radiation in the first 48 hours after detonation as that which they would receive if they stayed there for many months. The amount received can be lethal so that protection is mandatory. The only way for the Commander to know the radiological situation is to have radiation (radiac) instruments which are in good working order and trained personnel to use them. He must understand the significance of the reports of the situation which are rendered to him.

Know Nature of Hazard

An informed Commander must know the nature of the hazard, and the characteristics

of radiation, then he must have an appreciation of good shielding for his troops from the radiation. Approximately 50 per cent of the radiation received from a uniformly radiating surface comes from within 50 feet. He must have an accurate concept of the development of a fallout pattern on the ground, although he may not know the extent of the hazard without informed utilization of his monitors. The monitors are men regularly assigned to the unit and trained in the proper use of radiac instruments in addition to their usual duties with the unit. Monitoring is a regularly occurring operation at least once every twelve hours at one location in the company area during a period of non-utilization of nuclear weapons. The Commander should be informed promptly when there is any significant rise in the background reading of the instrument. The same monitors are trained in surveying an area of intended occupancy so that the Commander can be fully informed. Survey means that many readings are taken over the area of intended march or bivouac. In the event of movement, the unit can then take precautions based on the survey.

In the event that nuclear weapons are used, the Commander should require that frequent readings be taken with the radiac instruments and that he be informed of any sudden rise in the background. A rise of 5 r/hour is indicative that some action should be taken, because it is not known at the time of increase in background how high the readings will go. Action must be taken to protect his troops so that the Commander can be assured that his troops will be available to fight another day.

What Can the Commander Do?

The Commander has no way of knowing what the final radiation intensity will be until after fallout is complete. Therefore, prior planning and preparation of adequate shielding for his troops are mandatory. Undercutting foxholes, or preparing improvised shelters with dirt over the top are two ways of passive defense against radiation. If the buildings with basements are to be occupied, sandbagging around the house, laying bags of sand on the floor, or covering the first floor with a layer of dirt can be great protection if after the signal is given to take cover, the troops occupy the basement and close all windows to prevent fallout from getting inside. It may very well be that not more than 15 minutes or at most one hour warning period will be given before the maximum intensity of radiation in the area is reached.

There are several courses of action open to the Commander and only the military mission of the unit will dictate the course of action. For example, when the Commander is informed that radiation is imminent, he may (1) evacuate the area or (2) he may stay in the area. If he evacuates the area, he must be given authority (1) before the arrival of fallout or (2) after the completion of fallout (but not during the actual fallout). If the order is given to evacuate prior to the arrival of fallout, he must have (1) accurate prediction of (a) the extent of expected fallout and (b) the probable time of arrival of fallout in that area. He must have (2) time left to evacuate to location of predicted safety before fallout occurs. With all of these requirements, he will in all probability not evacuate prior to the arrival of fallout, but only after fallout has occurred, and then only if he can evacuate to a position that will afford him more protection from total exposure than the troops will receive during the evacuation plus the radiation which they will receive in the new shelter. This will mean that survey parties will have to make reconnaissance of the route to be taken and area of occupation prior to start of the evacuation. This may also mean that the monitors may be exposed to excessive amounts of radiation. Thus to insure that this is avoided, radiac instruments should have exposed probes (to the ambiant radiation) with the instruments read inside. The monitors should be ordered out only when the intensities are such that serious injury from radiation will not occur.

If the troops have sufficient shielding, the Commander may elect to stay or he may even be forced to stay. The shelters should be designed to permit living for a period of time with only short exposures of the patrols or the guards. Under any conditions, the Commander should have as minimum an informal arrangement for keeping account of the exposure of his troops, and considering that more than 25 r total exposure may somewhat lower the efficiency of his troops. It is considered that 150 r will not cause death of personnel but may cause some nausea and/or vomiting among the troops. With some kind of records and with good control over the troops exposures can be kept at a minimum.

If continued occupancy of the area is required, it may be necessary to plan and execute decontamination after the radiation level is sufficiently low. However, it must be sufficiently long after detonation that over exposure of the decontamination team will be avoided. It must also be determined that decontamination is worthwhile, because if sufficient time elapses, the radiation will have decayed to a point where decontamination is unnecessary, and the troops in the open will receive very little radiation. Decontamination of an area can be accomplished by scrapping, plowing, or sweeping. Radioactive fallout is on particles of approximately 100 microns in diameter, and react to mechanical movement as any dirt.

Decontamination

Decontamination of personnel may be accomplished by removing the radioactive particles from the individual by washing or brushing. If a person is walking, most of the particles will drop off with the movement of the body. However, the personnel who are wounded and are removed by stretcher may remain contaminated. The amount of contamination adhering to the clothing will be insufficient to constitute a hazard to the rescue worker, however at the aid station the contamination should be removed prior to evacuation, so as to keep unnecessary amounts of radioactive materials from being scattered in the hospital. This decontamination can be accomplished by washing, or even by judicious use of a vacuum cleaner. Further monitoring of the individual can be accomplished at the clearing station or other medical unit if indicated.

The Commander may decide upon a compromise of staying during fallout then evacuating after fallout is completed. This may well be the situation in a hospital. For example, he may evacuate the personnel for a period of time, then return to the area after the radiation has decayed to a safe level. Or he may order a partial evacuation, such as part of the patients and personnel, while those non-transportable patients stay behind with personnel for their care. In this case, smaller areas of protection will be required and more thickness of protecting material can be made available to prevent injury among those remaining behind.

As previously stated NEARLY ALL CASUALTIES FROM FALLOUT RADIATION ARE PREVENTABLE. This can be accomplished if the Commander has the proper equipment including radiac instruments, good communications, by knowing the nature of the hazards, and by knowing how, when, and where to monitor or survey. Above all, he should know the significance of radiation as a medical problem to his troops.

The Civilian Mortuary Service and Thermonuclear War

By

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AND

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(With five illustrations)

THE DISPOSAL of 39,000 dead following the Battle of Manila in 1945 described by Colonel Orth in MILITARY MEDICINE[1] offered a tremendous problem. It was remarkable that 81 men accomplished the task of collection and burial in eight weeks.

Relating Colonel Orth's experience to possible thermonuclear attack on this Nation, the case for Civil Defense Mortuary Service, at first glance, seems hopeless. In the State of Michigan, for example, a recent exercise established over two million deaths from an attack pattern comprising seven thermonuclear bombs. One million deaths occurred within 24 hours of the simulated attack. It is little wonder that the Civil Defense Mortuary Service has been generally neglected by Health and Engineering Services alike.

It is the purpose of the authors to suggest a realistic, practicable approach to the overall problem consistent with modern weapons effects. The basic material for this paper is drawn from the Mortuary Service Program of the States of Illinois, Indiana, Michigan, Missouri, and Wisconsin which are served by the Region 4 Office of Civil and Defense Mobilization.

FUNCTIONS

The FCDA Technical Manual,[2] "Mortuary Services in Civil Defense," outlines the basic responsibilities of the Civil Defense Mortuary Service. Such responsibilities include proper identification of the dead; establishment of legal proof of death; removal of bodies from public view; preparation of an official record of death; provision for religious rites and services as circumstances permit; and final disposal of the bodies so that they will not be aesthetic, psychological, or public health hazard. The manual emphasizes further that the major tasks for the survivors of an enemy attack will be care of the sick, injured and homeless, fire fighting, restoration of utilities and other normal services. Only an absolute minimum of manpower will be available for identification and disposal of the dead.

WEAPONS EFFECTS

Planning assumptions[3] basic to effective Civil Defense programs consider conventional as well as atomic weapons, chemical, biological and psychological warfare. Civil Defense planning is based upon the needs and requirements to meet an attack where the maximum size weapon used would be a 20 megaton thermonuclear bomb. Blast damage affecting structures from such a weapon burst may extend 20 miles from ground zero. Thermal intensities at 11 miles are estimated at 15 calories per square centimeter and secondary fires can be created even at 30 to 40 miles. It is logical to assume that most combustibles as well as the dead on the surface within a 10 to 11 mile radius of such a weapon burst will be either vaporized or incinerated through resultant fire storms. In the same area, the majority of persons in substantial underground shelters will have been spared provided their shelters were not demolished and temporary air supplies were adequate. Any dead theoretically salvageable will therefore be found between the 10 and 20 mile radii. Death will result from two primary causes, heat and injury from flying debris.

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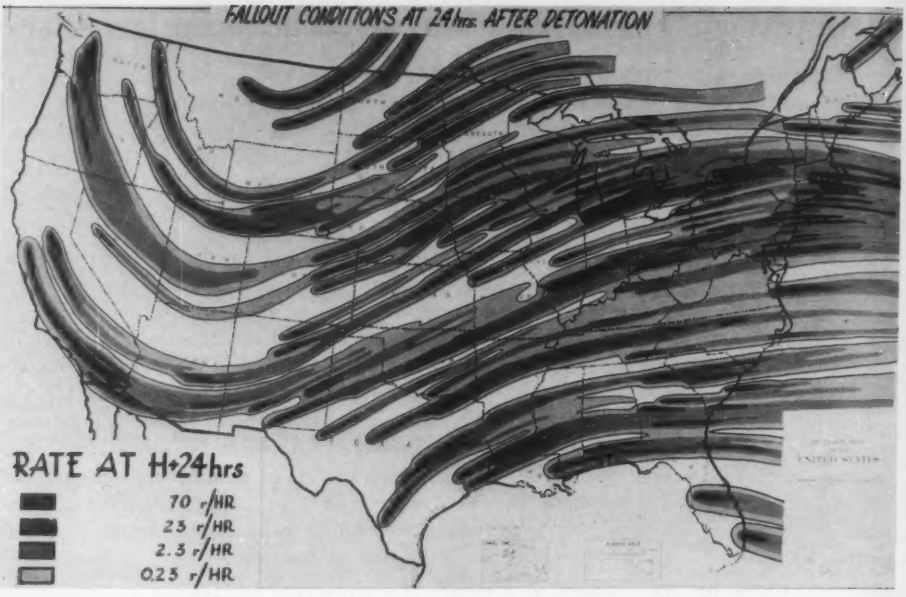

Fig. 1. 1959 Exercise. Fallout Conditions at 24 hours After Detonation.

A third element must now be considered. Within a short time, the emergent mushroom cloud heavy with radioactive material will end its ascent into the trophosphere and gradually fall back upon the earth. The radioactive particles not only fall on the blast-damage zone but are carried by prevailing winds over large expanses of land and water to distances of several hundred miles. Fortunately, most radioactive elements gravitating from the cloud decay rapidly but the injured in the blast area must find adequate cover within a half hour after the detonation if they are to survive. All people downwind from blast areas should appreciate the same invisible danger and take cover if they are to remain in good health. A glance at Figure 1 suggests that a high percentage of the nation's surviving population will have to remain under cover for days and even weeks post-attack. Radioactivity persists longer in areas where the initial dose rate was highest. Thus, the immediate blast areas may remain dangerously radioactive for months and even years as shown in Figures 2 and 3. Rescue operations in the blast area on a strictly calculated risk basis after a reasonable period of time must be limited to either rescue of survivors from shelters or a few essential services. The dead can wait and time will alleviate the task for the Mortuary Service.

Analysis and Discussion

Mortuary Service is basically concerned with two distinct and peak quantities of dead. The first enormity seen in Figure 4 represents the immediate deaths within the blast areas from blast, thermal and massive radiation effects. The second rise in deaths is experienced in areas away from blast damage and is attributable to radioactive fallout. Due to the latent period of radinjury, an upward curve in the death rate should be evident at two weeks post-attack, reach a maximum at four to six weeks and gradually subside during the following six months.[4]

The first problem has been greatly reduced for the Civil Defense Mortuary Service. Bodies of the deceased are generally lost within the 10 mile radius and intense radia-

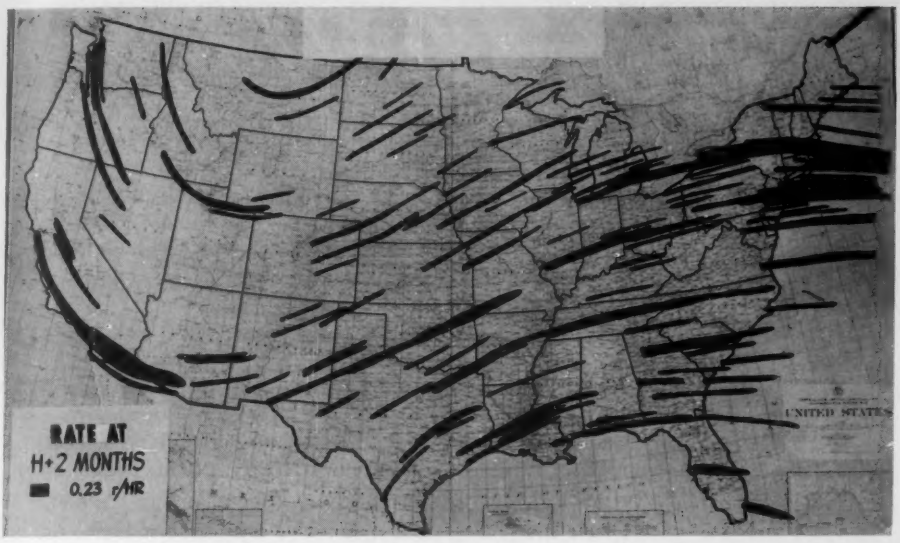

FIG. 2. 1959 Exercise. Fallout Conditions Two Months after Detonation.

tion has prevented little more than heroic rescue in the 10 to 20 mile zone for several weeks. What cadavers might be recovered early are those in the fringe of the blast area and upwind. Mortuary Service will provide mobile mortuary teams in the non-damaged support counties ready to proceed to the blast areas when Radiological and Engineering Services permit such operations. Since countless numbers of bodies, residual

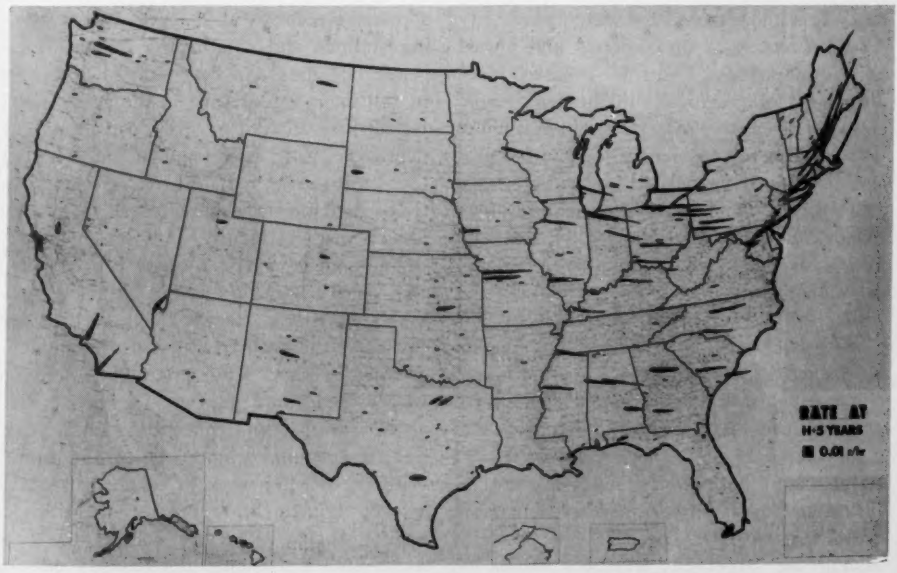

FIG. 3. 1958 Exercise. Fallout Conditions Five Years After Detonation.

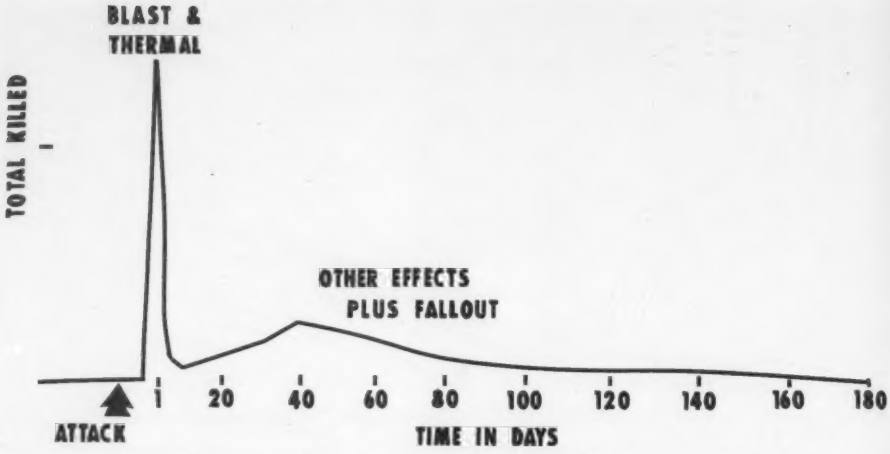

FIG. 4. Simulated Thermonuclear Attack on OCDM Region 4. 1959. Total Deaths by Time.

radiation, and lack of available manpower might counter effective removal of the dead, the primary duty of the teams will be identification. The city is lost and rehabilitation is unthinkable until residual radioactivity has effaced itself and sufficient resources have been re-established. It may be far simpler to build new cities elsewhere and allow the dead to sleep in their memorial. For obvious public health reasons, the demolished city must be fenced in or cordoned and placed under quarantine. Control of insects, rodents, and other animals in the fringe area may be necessary. We reiterate that there is little need to consider large-scale removal and disposal of the dead from the blast area. The problem of Mortuary Service in a thermonuclear war is drastically different from World War II where cities were rebuilt early on their ruins.

The second problem for the Mortuary Service is of considerable magnitude but can be relegated to practicality. During a recent simulated attack, the State of Michigan suffered over 500,000 deaths from fallout injury alone. Most of the victims, untouched by blast and thermal effects, either were unprotected populations located some distance from blasted cities or could be counted among the target city evacuees caught on the highways without shelter. In many instances, persons injured by radiation did not recognize their grave illness until days to weeks following attack when symptoms first become conspicuous. During this "lag" period, most evacuees were well dispersed throughout the support and reception areas, accounted for, and occupied to some degree in the recovery program. Refugees were billeted in private homes, often five or six to a room. Reception and Care Centers, feeding stations and existing as well as emergency hospitals had been staffed and were in full operation at least in the areas where fallout had decayed to levels permitting full operation. It is assumed that shortly after those injured by radiation realize the severity of their illness, they will seek the nearest known medical facility. Hospitals generally decontaminate, register, identify and admit the casualties and do what is humanly possible. Mortuary Service will recover the bodies of the dead from medical facilities in routine manner. Thus, regular procedures of the peacetime mortuary service can be preserved including collection, identification, record keeping, religious rites and burial. Little need be changed from normal routine except adjustment to greater quantities of dead. Mortuary Service collects the dead from both provisional and existing hospital morgues. Due to expected widespread fall-

out and far-flung dispersal of evacuees, every surviving mortuary in the nation must prepare for a share of the dead.

In Region 4, morticians will plan to expand their facilities at least fivefold, arrange for minimum embalming services and train auxiliary staff for 24 hours' continuous operations. In the average mortuary, minimum embalmment may be administered in an hour. Five embalming tables offer a theoretical capacity of 120 cadavers per day. Churches and families will immediately obtain the deceased on proper identification, and religious services with burial should be consummated within 48 hours. The Police and Engineering Services assist with interment and disposition of unclaimed bodies. The unclaimed may be accepted by churches or, if necessary, interred in temporary trench graves located on publicly-owned land. The Department of the Army Field Manual, "Handling of Deceased Personnel in Theaters of Operations,"[5] is a good general reference and offers techniques for the location of temporary cemeteries, trench burials, and grave marking. The temporary trench burial on public land makes it possible for separated families to claim relatives at any later date and reinter the bodies if they wish.

Mortuary Service Organization

The National Plan for Civil Defense and Defense Mobilization[3] promulgated by the President in October 1958, states that Civil Defense is the responsibility of each citizen and of all governments—Federal, State, and local—with the Federal Government having the role of direction and coordination of the total National effort.

Chief Executives of States and local governments direct the Civil Defense and Defense Mobilization activities within their jurisdiction. With the assistance of their Civil Defense staffs, the chief executives direct the performance of emergency functions within the legally constituted governmental structure, augmenting it where needed.

Thus, Governors appoint their State Health Officers to act as State Directors of the Health and Medical Service and all official public health agencies from State to local level are responsible for leadership and authority in carrying out the mission of the Service. In general, The State Operational Survival Plans of OCDM Region 4 consider the County Mortuary Service to be the basic unit of organization.

The State Health Officer usually assigns the Chief of the Bureau of Vital Statistics as the Chief of the State Mortuary Service. The major concern of this appointee is to insure registration of all vital events in time of emergency. He provides a capability among the counties and cities in emergency registration. His office may contribute special forms and short cuts which would enable local registrars to meet any situation even under loss of communications.

A State Advisory Mortuary Committee appointed by the State Director consists of representatives of the State Funeral Directors and Embalmers' Association as well as other organizations having common interests. The Committee assists the County Directors of Mortuary Service in planning, implementing, and training, particularly in matters of identification, burial procedures and special problems of handling the dead. Although this Committee continually advises the State Civil Defense Director of progress in the field, it does not have operational responsibilities at the county level.

At Area or District level, an Area Advisory Mortuary Committee should be similarly appointed by the District Health Officer to mediate the mutual aid problems of the designated target area and its support counties. Target city Mortuary Service personnel are assigned to support county Mortuary Services in the plan of evacuation. Evacuation possibilities[3] are considered in a strategic warning (possible attack), tactical warning (imminent attack) if time permits, and from shelters or places of refuge at some calculated time following attack during decay of radiation. Support county personnel thus must work with their colleagues from target cities in planning, training, and

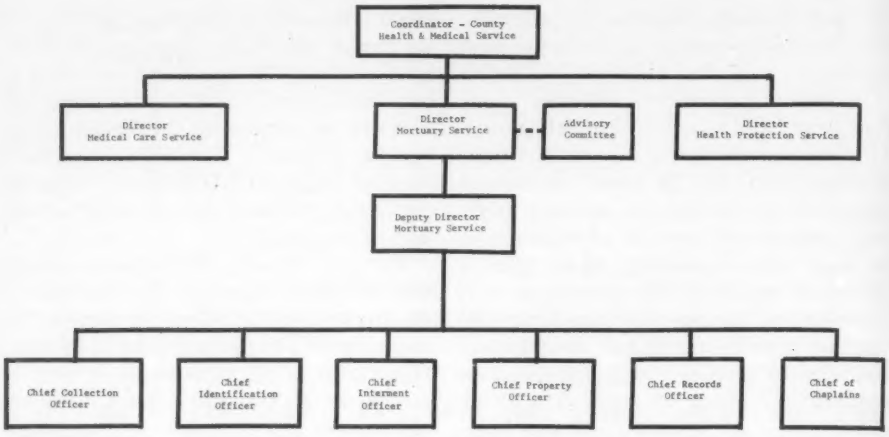

FIG. 5. Organization Chart. County Mortuary Service.

implementation of the mutual aid program.

In target and support counties alike, the County Director of Health and Medical Service appoints a local mortician to act as Director of the County Mortuary Service. In the best interest of professional manpower, medical examiners are assigned to the Medical Care Service rather than the Mortuary Service. The County Police Service retains the support of the coroner's office as required but the obvious war dead will not require the investigational services of a coroner.

The staff of the County Director of Mortuary Service, as shown in Figure 5, consists of a Deputy Director, Chief Collection Officer, Chief Identification Officer (from Police), Chief Interment Officer (engineer), Chief Property Officer (a bonded member of a police property clerk's office), Chief Records Officer (registrar), and Chief of Chaplains in consultation with the County Religious Affairs Committee.

A County Advisory Mortuary Committee is appointed to represent Engineering, Rescue, Police, Reception and Care, and Transportation Services, the County Health Department, the Funeral Directors and Embalmers' Association, cemetery associations, clergy, and others.

The Director organizes the staff section, selects mortuary and burial areas, provides for custodial care of personal property from the dead, plans for expansion of existing and improvised facilities, lays in stock simple burial containers, materials, and equipment required for emergency operations, enlists the participation of the clergy, recruits mortuary teams, trains personnel and arranges for a supply of business machine Mortuary Cards provided by the State Department of Health.

Collection teams consist of two men each, assisted by a driver and a truck furnished by Transportation Service. An identification team comprises three men, and an interment team includes two men supported by a driver and truck. Such teams are developed to function in the support counties for the collection, identification and interment of the dead obtained from hospitals and homes. Although the teams seem minute, the trained team leaders will draw additional workers from their communities whenever necessary. This flexibility in approach allows for any exigency, large or small. The number of teams to be organized in a mutual aid area is based on the problems expected in any particular support county and considers such factors as proximity to the target area, evacuation routes of target area population, and Reception and Care Service estimates of

evacuees. The Area Advisory Mortuary Committee serves to define such problems for the counties.

As soon as sufficient decay of radiation at the edge of the blast area permits operations, selected County Mortuary Service Directors of the support area are requested to send available Mortuary Service teams to designated rendezvous points near the target city. The counties dispatch teams expanded with workmen usually drawn from the billeted evacuees. From the rendezvous points, the mortuary teams follow Radiological, Rescue, and Engineering Services into the blast areas. Due to residual levels of radiation and the psychological aspects of the work, the workers must be rotated frequently.

Emergency morgues should consist of at least four separate rooms or areas. These are a receiving room, a room for the viewing of bodies, a room for the storage of bodies not suitable for viewing, and a room for the storage of personal valuables and official records. Space for embalming or other preparations for burial may be either separate or combined with the suggested storage space for bodies considered not suitable for viewing.

Each morgue is managed by the Morgue Director. His staff includes a qualified person to confirm the fact of death of each body immediately after arrival, a Property Custodian (from Police), an Identification Officer (from Police) who controls the viewing of bodies and other identification procedures, a Recorder and assistants who are responsible for keeping prescribed records, a coroner's representative who has authority to sign death certificates and order disposal of unidentified bodies and a minimum of four morgue attendants for the handling of bodies. Reception and Care Service assigns informational staff to meet the public and the Police Service provides personnel for protection of personal property, records, and the premises.

Mortuary Techniques

Various technical procedures for Mortuary Service personnel need not be discussed here. Several publications are available for use and are offered as basic manuals for the Mortuary Service. The Army Field Manual[5] mentioned earlier, contributes information on temporary cemeteries, search, recovery and evacuation, identification, burials, grave marking, disinterment, sanitation, hygiene, records and reports. The FDCA publication TM-11-12, "Mortuary Services in Civil Defense,"[2] furnishes general considerations, planning, organization and recommended training programs. Tagging of the dead is covered in another FCDA publication TM-11-3, "Organization and Operation of Civil Defense Casualty Services, Part III, Medical Records for Casualties."[6] Applicable Radiological Defense publications are available from State and local offices of Civil Defense as well as from OCDM, Battle Creek, Michigan. Mortuary Service personnel should also be familiar with the hazards of biological and chemical warfare and look to public health for special training.

Command and Communications

The Director of the County Mortuary Service should be given full authority under Civil Defense emergency regulations[3] to carry out the duties of his office and, in addition, should receive the legal delegation necessary to comply with local laws covering the unknown dead. Furthermore, the Director is in in command of all Mortuary Service personnel in the county including displaced personnel from the Target Area.

Communications, generally, will be provided by the Communications Service. In the reception county, trunk telephone systems may be necessary to interconnect morgues, hospitals, and the Director's office. Mortuary teams proceeding to blast areas require mobile radio communications which might be improvised from the use of buses, taxicabs, ambulances, police cars, or various army surplus units.

Supply

In the immediate post-attack period, supplies on hand locally will be the only ones available to the Mortuary Service. Conse-

quently, support county morticians should increase their inventories as far as possible. Target city morticians may consider buying their supplies a year or two in advance and storing a rotatable share in the preassigned support county mortuary. Used and worn equipment when replaced may also be stored in the reception areas. Finally, the OCDM Federal Contributions Program[3] shares with the States and their political subdivisions the cost of procuring certain Civil Defense equipment. There are no Federal stockpiles of specific Mortuary Service items.

Summary

Present advances in Mortuary Service planning have been discussed with due regard for modern weapons effects. In a field which has been generally neglected by Civil Defense, a realistic approach has been necessary. Simple logic and understanding can erase dangerous fatalism and apathy. We conclude that the Mortuary Service is an essential program toward safeguarding morale and health and is manageable even under the adverse conditions of thermonuclear war.

References:

[1] Orth, G. L.: Disaster and Disposal of the Dead, Mil. Med., 124: 505-510 (1959)

[2] Mortuary Services in Civil Defense: FCDA, TM-11-12 (Tech. Manual), April 1956

[3] The National Plan for Civil Defense and Defense Mobilization: Executive Office of the President, Office of Civil and Defense Mobilization, October 1958

[4] The Effects of Nuclear Weapons: U. S. Department of Defense and Atomic Energy Commission, June 1957

[5] Handling of Deceased Personnel in Theaters of Operations: Department of the Army Field Manual, FM-10-63, October 1952

[6] Organization and Operation of Civil Defense Casualty Services, Part III, Medical Records for Casualties: FCDA, TM-11-3 (Tech. Manual), March 1952

"These are the times that try men's souls; the summer soldier and the sunshine patriot will, in this crisis, shrink from the service of his country; but he who stands it now deserves the love and thanks of man and woman. Tyranny, like hell, is not easily conquered; yet we have this consolation with us that the harder the conflict the more glorious the triumph. What we obtain too cheap we esteem too lightly. 'Tis dearness only that gives everything its value. Heaven knows how to set a proper price upon its goods, and it would be strange indeed if so celestial an article as Freedom should not be highly rated."—Thomas Paine.

The Use of Radioisotopes in Medical Practice*

By

CAPTAIN E. R. KING, MC, *U. S. Navy*†

DURING the past decade, the use of radioisotopes in clinical medicine has increased from a stage of experimental level to one of routine procedure. Because of the wide range of application of radioisotopes in medicine, it is impossible to discuss this subject completely. Consequently an attempt will be made to discuss quite briefly various types of clinical radioisotope procedures that have now been accepted. We will also mention possible applications in the future.

A misconception regarding the medical use of radioisotopes exists in the layman's mind and also in the minds of many of our medical colleagues. Radioisotopes are not too important in the treatment of cancer. Relatively few types of cancer are treatable with this agent, and, as yet, there is no positive evidence of cures of cancer by radioisotope therapy. Moreover, the use of radioisotopes in treatment of all conditions constitutes less than five percent of all studies utilizing this new type of drug. In other words, the diagnostic application of radioisotopes is far more important and far more prevalent than any method of therapy. In our own institution only a small percent of the patients, referred to our laboratory, undergo any form of radioisotope therapy. This can be noticed in Table 1.

Because of this fact, most of this paper will be dedicated to the discussion of diagnostic radioisotope procedures. These procedures will be divided into several subgroups depending upon the body system or

TABLE 1

WORK LOAD (JANUARY 1-JUNE 30, 1959), RADIOISOTOPE SECTION, DEPT., OF RADIOLOGY, U. S. NAVAL HOSPITAL, BETESDA, MD.

	No. Studies	*No. Patients*
Radioisotope Therapy		
Colloidal Au^{198}	6	6
P32	8	8
I-131 (Hyperthyroidism)	8	8
Diagnostic Studies		
Thyroid Function		357
30 min., 2, 3, 4, 6, and 24 hr. uptakes	452	
Tri-iodothyronine-I-131 RBC uptake	331	
PBI Conversion Ration	5	
Chemical PBI	301	
Thyroid Scintiscan	256	
Thyroid Stimulating Test	6	
Thyroid Suppression Test	3	
I-128 Thyroid Uptake	1	
Kidney Function		
Diodrast—I-131	13	11
Liver Function		
Rose Bengal—I-131	16	11
Liver Scintiscan	7	7
Pancreatic Function		
Triolein—I-131	24	18
Oleic Acid—I-131	5	5
Cardiac Output	1	1
Blood Volume RBC—Cr^{51}	380	314
RBC Survival—Cr^{51}	8	6
Erythrokinetics:		
RBC Survival	4	4
Plasma Fe^{59} Disappearance	4	
Fe^{59} Utilization	4	
Plasma Fe^{59} Turnover	4	
RBC Turnover	2	
In vivo Fe^{59} counting	4	
Brain Tumor localization:		
As^{74}	10	10
Cu^{64}	73	69
Schilling Test—$B_{12}Co^{60}$	20	17
P^{32}—Bone Tracer	12	12
Total	1,968	864

* Presented at the 66th Annual Convention of the Association of Military Surgeons of the United States held in Washington, D.C., November 9-11, 1959.

† Chief of Radiology, U. S. Naval Hospital, and Director, Department of Nuclear Medicine, U. S. Naval Medical School, National Naval Medical Center, Bethesda, Maryland.

physiological function that the radioisotope study pursues.

Function Studies

Thyroid Function. The original application of radioisotopes in medicine was a study of the thyroid function, whereby the biological localization of radioiodine was measured by the thyroid gland of the human. This was called the thyroid uptake and it is still perhaps the most prevalent application of radioisotopes by the medical profession.

The thyroid uptake is usually performed by giving a measured dose of I-131 and at a stated time later—2, 6, 8, or 24 hours, the percentage of the dose which is deposited in the thyroid is measured by a radiation detection instrument. This study has many drawbacks, and additional studies using radioiodine have been developed. Some of these are the conversion ratio, the saliva PBI ratio, the thyroid clearance, and more recently, the uptake by the erythrocyte of Triiodothyronine-I-131. Our laboratory has accepted the latter test as being as reliable as any other thyroid function test, and now uses this test routinely in all patients referred for study. In this test we measure the amount of Tri-iodothyronine labeled with I-131 that is picked up and retained by the red blood cell, in vitro, over a period of several minutes.[1] In this study no radioactivity is given the patient and, thus, it has an advantage over the other I-131 thyroid function studies. In addition, it requires only one visit by the patient to the radioisotope laboratory and the patient need stay there only long enough to have blood drawn, and, in fact, need not visit the laboratory if a blood collecting service is available in the medical center concerned. Our laboratory has compared the results of this test, which is also known as a "Freedberg Test," with the 24-hour thyroid uptake, the 6-hour thyroid uptake, the chemical PBI, and, in certain instances, a conversion ratio. As stated, we have found it thoroughly reliable.

Kidney Function. This study is of the kidney uptake and clearance of Diodrast which is labeled with I-131. Other radio-opaque media have been used which also are labeled with radioiodine. In this study the position of the kidneys is located by obtaining an upright film of the abdomen, and two scintillation probes are positioned over the upper pole of each kidney, each pointing slightly downward to miss the liver and spleen. Each probe is connected to a counting-rate meter and recorder. The probes must be balanced against a standard source prior to their use. The labeled Diodrast is injected intravenously, the counting-rate meters are started simultaneously, and a record is made of the clearance of the labeled Diodrast from each kidney. This study has proven very effective in the study of certain types of hypertension and its relation to renal disease. It has an advantage over the intravenous pyelogram in that it can more adequately determine the psysiological status of each kidney.[2]

Liver Function. Liver function studies are performed very similar to the kidney studies by the determination of the uptake and excretion of a labeled dye, Rose Bengal-I-131, by the liver. Here again, the labeled dye is injected intravenously and the uptake is measured by a probe placed over the liver, again pointing slightly downward. The uptake of the dye and the excretion of the dye from the liver can be determined by the curve obtained on the recorder, which is connected to the counting-rate meter. One can also determine whether or not there is an obstruction of the biliary tree by this procedure.

Pancreatic Function. These studies concern the pancreatic function insofar as exocrine-enzyme secretion is concerned. By administering a labeled neutral fat, Triolein-I-131, one can determine whether the amount of the enzyme lipase secreted by the pancreas is of normal amount, and thus, whether the exocrine function of the pancreas is adequate. This is performed by giving a predetermined amount of the labeled fat with a marker by mouth and collecting the stools of the patient until the marker has completely passed, then assaying the stools for radioactivity. In a

normal individual, practically all of the labeled fat is split into glycerides and fatty acid, and a very small portion is excreted. If there is pancreatic disease, the chances are that a lesser amount of the neutral fat will undergo digestion, allowing a greater amount of the label to appear in the stool. It is recognized that an increased amount of labeled fat in the stool, while possibly indicating pancreatic disease, may also occur in diseases of the upper small intestine, particularly in the malabsorption state. Consequently, this test is refined by repeating the study with a labeled fatty acid, Oleic Acid-I-131. The repeated test with fatty acid is performed exactly as is the test with the neutral fat. If, after administering labeled fatty acid, an increased amount of the radioiodine appears in the stool, this would indicate a malabsorption state, rather than pancreatic dysfunction. If, after an abnormal neutral fat excretion with an increased amount of radioiodine in the stool, the labeled fatty acid secretion appears of normal levels, it would indicate that the cause of the trouble probably lies in a pancreatic dysfunction resulting in a decreased excretion of pancreatic lipase.[3]

Cardiac Function. The cardiac output study, using human serum albumin-I-131, can be considered a study of the function of the heart, although it is many times placed under a different category of radioisotope procedures. In this study, a counter is placed over the upper border of the heart and is connected to the counting-rate meter and recorder. The labeled compound is injected very rapidly into a peripheral vein as a bolus, and the curve resulting on the recorder demonstrates the rate this compound passes through the heart into the pulmonary circulation. A smaller hump is seen when it reenters the heart and passes to the systemic circulation. The curve obtained by this study is quite similar to the curve obtained by the more commonly used dye dilution studies. While this study has proven quite effective in many clinics, it is still under evaluation. However, if it is developed to where it becomes practical, the advantages over the present system of cardiac output are numerous.

Hematological Studies

Blood Volumes. The blood volume determination can be made using several substances. However the true blood volume or the red cell volume can be measured only by labeling the red blood cell. Blood volumes, involving the measurement of the albumin space and the utilization of the hematocrit to correct for the total blood volume, are valid in the normal individual. However it is well known that the albumin volume and the plasma volume vary tremendously under stress, debilitation, certain cardiac, kidney and liver diseases, anaesthesia and surgery. Consequently, in the diseased or traumatic cases, an adequate blood volume can be obtained only if the labeled red cell is utilized.

In our laboratory, as elsewhere using this technique, the patient's own red blood cells are incubated for 45 minutes with a small dose of Cr-51. This isotope enters the red cells and binds to the hemoglobin. After washing the red cells in cold saline solution, they are reinjected into the patient, and twenty minutes later another sample of blood is drawn. The radioactivity of the patient's second sample is compared with the dose of labeled cells of RBC-Cr-51 administered to the patient, and by simple ratio, the volume of the patient's blood can be determined. This test is now widely utilized and in our own hospital it is performed on all major surgical cases, pre and post-op. If excessive blood loss occurs, repeated blood volume determinations are continued until the patient's blood volume has been stabilized by transfusions.

Red Blood Cell Survival. This study also involves the labeling of the patient's red blood cells with Cr-51, exactly as in the previous procedure. In fact, after the blood volume has been performed, repeated studies of radioactivity of the patient's blood can be carried on at two or three day intervals for two or three weeks. If the percent of the radioactivity remaining in 1 cc. of the patient's blood on the succeeding days, is compared with the percent of radioactivity in the pa-

tient's blood on the first day, a curve can be drawn. At the 50% remaining level, the corresponding day is noted, and this is termed the half-time of red blood cell survival. This value will not coincide directly with the life span of the red blood cell but is an indication of the exponential rate of destruction of the red blood cell itself. A normal half-time of red cell survival in our laboratory is 25 to 35 days. An increased rate of destruction with a shorter half-time, would indicate a hemolytic process, or similar conditions.

Red Blood Cell Production. The rate of production of red blood cells can be determined by labeling the patient's plasma with Fe-59, in vitro. This is then returned by intravenous route to the patient and as the iron is broken from the plasma fraction, it travels to the bone marrow where it is incorporated into growing red blood cells. The new erythrocytes labeled with Fe-59 are then released from the bone marrow into the blood stream.The rate of their release into the blood stream can be measured by withdrawing samples of blood at two or three day intervals from the patient, and counting them for Fe-59 content. A curve is drawn and it is determined whether or not the production rate of the red blood cells is normal, increased, or decreased. In the normal individual, 80 to 90 percent of the Fe-59 injected into the patient, will appear in his peripheral blood in approximately 8 to 10 days. In the aplastic anemia patient, the return of the Fe-59 labeled RBC will be much slower. In the patient with acute blood loss, compensated hemolytic disease, and so forth, the return of the red blood cell to the peripheral blood may be at a more rapid rate than normal.[4]

Combined Studies. The above three studies may be combined into one procedure whereby the patient may be given both Cr-51 labeled RBC, and Fe-59 labeled plasma. Simultaneous red blood cell destruction and red blood cell production may be studied by using a gamma ray spectrometer whereby the separate isotopes may be counted individually, according to their gamma ray energy.[5]

$Co^{60}B_{12}$ In Vivo Study. This study, which is also known as the Schilling Test, involves the application by mouth of Vitamin B_{12} labeled with Co^{60}. This is a test for the absence of Intrinsic Factor in the patient's stomach, hence for the diagnosis of pernicious anemia. This diagnosis may be made even though the patient is in remission and is the only single definitive test for pernicious anemia. The labeled Vitamin B_{12} is administered orally, followed by a large flushing dose (1,000 micrograms) of stable Vitamin B_{12}. The latter dose saturates the liver and the B_{12} binding capacity of the patient's plasma. The dose of Co^{60} involved is only one-half microcurie. The patient then collects his urine for 24 hours. A radioassay is then performed upon the urine and the percentage of the administered dose of Co^{60} is determined. In the normal individual, the excretion will be 13-15% of the administered dose. In the abnormal individual, the excretion will be less than 5% of the administered dose. Pernicious anemia will present inadequate absorption of Vitamin B_{12} due to lack of Intrinsic Factor. Malabsorption states may produce inadequate absorption, also. The cases of pernicious anemia can be differentiated from the malabsorption syndrome cases by repeating this study, followed by a dose of Intrinsic Factor which is given orally. If the patient lacks Intrinsic Factor to allow him to absorb his Vitamin B_{12}, the addition of Intrinsic Factor to the test will revert the formerly abnormal excretion to the normal, higher level. However, if the patient's gastro-intestinal tract is not absorbing properly, the addition of Intrinsic Factor will not affect this absorption, and the urinary excretion will remain abnormally low. When Vitamin B_{12} is absorbed it is stored in the liver and undergoes slow renal excretion.[6]

Localization Studies

Studies localizing tumors, whether benign or malignant, can be performed by automatic scanning. Currently, all of the automatic scanning utilizes a detector which is a scintillation crystal, therefore, the term "scintiscanning" or "scintillation scanning." Many dif-

ferent types and combinations of scanners are available on the commercial market. At this time the commercial scanners, for the most part, are all best fitted to one type of scanning, and there are none available which can adequately perform all of the localization studies described in this paper.[7]

Brain Tumor Localization. The most important and useful form of a localization study is felt by many clinicians to be that for brain tumors. Brain tumors do not localize more of a radioisotope or radioisotope-labeled compound than do parts of the body other than the brain. However, the tumor will localize more than the surrounding brain, which does not contain any of the circulating radioisotope. The blood-brain-barrier system has been described as being able to eliminate foreign materials in the blood from circulating through the brain. A brain tumor will break down the blood-brain-barrier system allowing a normal amount of radioisotope in the blood to circulate into the tumor. Thus, there is a differential in the uptake of a radioisoptope in the brain tumor compared with normal brain, and by this differential, one can detect the increased amount of radioactivity in the brain tumor. In certain instances trauma, and abscesses, may also allow the radioisotope or radioisotope-labeled compound to enter the areas involved, and thus, they may also be localized as are the tumors. If tumors are extremely slow growing, the disruption of the blood-brain-barrier system may not be as apparent, and thus, it is difficult to locate these slow growing tumors.

For most brain tumors, however, which develop rather rapidly, one is able, by using special scanning devices, to locate the tumor, which is automatically printed on a paper. The most common type of brain tumor scanners are the positron scintiscanner; an automatic scanner with a large, three inch diameter crystal and a focusing collimator; or a smaller crystal with a long tube, single bore collimator. For further information, one is referred to the literature.

The result of brain tumor localization, using automatic scintiscanning and radioisotopes, is about as good as any other method, which would include air studies and cerebral angiography. The ease with which this examination is made makes it an ideal method for clinical study.

Thyroid Nodule Localization. There has been much discussion as to the actual value of locating nodules in the thyroid. In practice, it is quite handy to have before one a printed scan of the thyroid outlining the nodules, in determining whether or not they pick up a normal, an increased, or a decreased amount of I-131. Experience has shown that nodules which do not localize radioiodine, or localize it in markedly decreased amounts, have a greater chance of being malignant than do other nodules. Also, if a nodule appears to localize an increased amount of radioiodine, the chances of it being malignant are very small. These facts are of value to a surgeon in planning for thyroid surgery.

In addition, thyroid scintiscanning is of some value in studying thyroiditis and other diseases of the thyroid or adjacent to the thyroid.

In certain types of carcinoma of the thyroid, that are well differentiated, and form colloid, it is possible to locate and evaluate metastases and metastatic processes. As the usual thing, however, in order to locate a metastatic process in a distant area by scintiscanning, the normal thyroid gland should have been removed from the neck. Scintiscanning in studying thyroid carcinoma can be quite valuable once ablation of the thyroid has been carried out and the patient is being treated for distant metastases. At every follow-up check, a scan can be performed over suspicious or known areas of metastases and the extent of these metastases may be visualized.

Liver Scanning. This study is still under evaluation, and a special type of scanning mechanism is probably desirable for optimal use. There is probably no commercial scanner available that can perform good scans of the liver. The best mechanism would be a large crystal with a focusing collimator and a photoscanner, or perhaps a crystal with a

long, single bore collimator. In either case, it might be well to be able to remove the background counts that are caused by the scatter of radiation from the liver and which appear along the outside of the margins of the liver. This can best be done by magnetic tape.

Liver scanning is an attempt to outline malignant nodules of the liver which are practically always metastases from distant organs. From a surgical standpoint, it would be of great benefit to be able to determine whether or not both of the large lobes of the liver are involved in the metastatic process or whether perhaps a small area of the liver is involved and the remainder of the liver is relatively free. However, because the liver presents such a large mass of tissue and is so irregular in shape, it is extremely difficult to scan over the surface of the body and adequately interpret the results of such a scan.

With newer ideas in mind, it is hoped that in the future scanning of the liver will evolve into the useful practice that clinicians desire.

Other Localization Procedures. An additional procedure of localizing tumors is in the eye. Here, the scanning, is done manually by placing a small end-window Geiger tube at various portions of the eye and comparing your readings with the opposite or normal eye. By using an injection of P-32, it is possible to determine the uptake of an increased amount of this radioisotope in malignant tissue. Usually, if an increase of 20% over the average readings of the other eye is obtained, it would indicate a possibly malignant process.

In addition to scanning of the thyroid, liver and brain, studies are also being made in scanning the gall bladder, the spinal cord, and the outline of the heart. In the latter instance, it has been possible to differentiate between cardiomegaly and pericardial effusion, by injecting human serum albumin-I-131 intravenously, followed by automatically scanning over the precordium.

Instruments are being developed very rapidly that, when perfected, will be able to perform all of the above scanning procedures. This, coupled with the fact that interpretations are being made by playing back the results on magnetic tape, or transmitting them on to a television screen by a method of closed circuit television and video-gain amplification, will, in addition, allow greater and more useful application of scanning procedures. Probably the greatest chance for advancement in this method of isotope study would be advances in chemical procedures. Thus, if the chemist can develop certain compounds which, when labeled with radioisotopes, would locate in specific organs, or, in cancer of these organs and their metastases, one could not only pinpoint the areas of cancer and follow their metastatic spread, but might even differentiate as to which type of tumor is involved. This might be a euphoric attitude toward the problem, but with the advances made in chemistry in other fields, it should not be hoping too much that the chemist may come to our assistance in locating and treating various forms of malignancy.

Space and Metabolism Studies

These studies, while not as dramatic as some that have been mentioned, nevertheless are extremely important in clinical medicine. Some of them are still under evaluation, but once perfected, appear to be quite important.

Blood Volumes. I have the habit of telling our radioisotope students that if there is one determination or study using radioisotopes that may ever be life saving, it is the blood volume procedure. This has been discussed under hematological studies but it is also a space study and, in fact, is an isotopic dilution study.

Other isotopic dilution studies which are of interest, although not as important as a blood volume, are:

Total Body Water. Total body water can be determined by administering a small dose of Tritium (H^3), an isotope of hydrogen, in the form of tritiated water. After a short time allowed for equilibration of the labeled water throughout the body, a sample of urine or blood is examined and by simple deter-

mination, the volume of water in the patient's body can be determined.

Extracellular Fluid Space. This study can be performed by administering SO_4 with the sulphur in the sulphate radical in the form of S-35. The extracellular fluid space is all of the water outside of the cells of the body and at times is of critical important. This is also an isotopic dilution study and is quite simple to perform.

Total Exchangeable Sodium and Total Exchangeable Potassium. These studies are performed using Na-24 and K-42. They can be performed simultaneously if one has proper counting equipment. During the course of these studies one determines the sodium space and/or potassium space in the body and using the serum sodium and serum potassium levels can quite easily determine the total amount of exchangeable sodium or potassium in the body. In cases of electrolyte imbalance or questions of electrolyte imbalance, it is extremely important to determine the total amount of sodium and potassium available.

Summary

The use of radioisotopes as a diagnostic tool in medical practice far outweighs their application in radiation therapy. Several diagnostic studies are mentioned that are now accepted as routine procedures in most medical centers.

The future application of radioisotopes in medicine is tremendous. Additional assistance is needed from the biochemist in order to prepare labeled materials that will localize in specific organs, or in tumors of various histological patterns.

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"Let us have faith that right makes might, and in that faith, let us, to the end, dare to do our duty, as we understand it."—Abraham Lincoln.

Air Force Nurses Progress Toward the Space Age*

By

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TEN YEARS have passed since the Air Force Nurse Corps was designated as a component of the Air Force Medical Service. During this short period of time, the youngest of the Military Nursing Services has demonstrated its ability to cope not only with immediate, every day problems but also to plan and prepare for the future.

When the Air Force Nursing Service was established in July 1949, approximately 1200 nurses transferred from the Department of the Army to the Department of the Air Force for the purpose of organizing, planning and staffing this new nursing service. I was among those who transferred, and like many of the others, my reasons were an interest in flying and a desire to apply the knowledge and experience I had gained as a flight nurse with the Army Air Corps to caring for the personnel of a rapidly expanding Air Force.

To meet the immediate needs of this new nursing service, it was imperative to establish an active procurement program, effectively utilize all available nurse personnel and provide training in the various nursing specialties including those areas peculiar to an Air Force Nursing Service. During the past 10 years, these requirements have been met; however, like our sister services, procuring and training personnel are constant challenges.

The Air Force Nurse Corps had not yet celebrated its first anniversary when the emergency arose in Korea. Because of inadequate roads, rail and port facilities in that country, air transportation was the method of choice for evacuating casualties. It was necessary to supply, within a very short period of time, a large number of medical flight teams, composed of nurses and aeromedical technicians, to care for the patients being transported by air. Although thousands of nurses were trained as flight nurses during World War II, most of them had separated from the service. After the war, air evacuation continued but on a very small scale and very few nurses were trained for flight duty. Consequently, we were unprepared for the Korean emergency; however, we met this challenge with hospital nurses who volunteered for the assignment. These nurses were quickly briefed and in a matter of hours were aboard planes caring for seriously wounded soldiers, sailors, airmen and marines. Although air transportation was accepted as the method of choice for the movement of patients during World War II, we learned and profited from the Korean experience. The increased demand for more flight nurses during the Korean conflict, created a need to expand the training facilities. As a result the Flight Nurse Course was moved from Randolph Air Force Base, Texas to Gunter Air Force Base, Alabama in October 1950.

Today, the peacetime transportation of patients, requires world wide assignment of flight nurses. In order to meet this requirement, and provide a large reserve pool of trained flight nurses for emergency or combat duty, we continue to train 200 nurses in this specialty annually. The Air Force Nursing Service has found it necessary to provide a continuous training program. The curriculum for each course is revised as needed and additional specialty courses are added when indicated.

The preparation of Air Force nurses is guided always by the changing needs of the world in which we live. Thus, when the threat of nuclear attack became more apparent, the Flight Nursing Curriculum was

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revised in order to include additional hours on disaster nursing.

Not only flight nurses but all nurses newly commissioned in the Air Force receive formal instruction in the care of mass casualties. During the four weeks Basic Orientation Course conducted at Gunter AFB, Alabama, for all Medical Service Officers, 35 hours of instruction on Disaster Casualty Control are presented. By including this training in the Basic Orientation Course, we are able to reach every nurse officer appointed in the Air Force.

Even though the nursing profession for several years has been revising educational programs, and conducting workshops and institutes to increase the knowledge and skills in the nursing management of mass casualties, it appears that inertia is still predominant among the majority.

In a poll taken last year of 40 students in the Flight Nurse Class at Gunter, not a single nurse had had undergraduate training in Disaster Nursing, and only one had had any sort of graduate instruction. Of approximately 70 nurses attending the Basic Orientation Course, approximately one-fourth had had some degree of disaster training. Although for some time the nurse students at Gunter had been receiving instruction in the concepts of atomic and nuclear structures and the hazards of nuclear explosions, during the past year the amount of training has been increased with more learning by doing.

Because we have seen these young nurses perform in a field problem simulating a disaster, the nurse instructors at Gunter are well motivated in regard to the importance and urgency of this training. We have not had any of the students in shock but we have had quite a few in tears, and the reason for this is their feeling of inadequacy in this emergency situation.

We have found it most difficult to put across to these nurses the guiding policy in the management of mass casualties—this policy is "the best for the most"; not ideal or even good treatment for a few, but as good treatment for everyone as can be obtained. Because they are nurses and the philosophy of their training has always been providing optimum care for each individual patient, they find it very difficult to accept the fact that many of the traditional nursing practices and techniques which militate against the best for the most may have to be discarded.

We realize that we merely "scratch the surface" by providing only 35 hours of instruction in this area. These nurse students are exposed, so to speak but for the most part, they are well motivated in regard to acquiring additional knowledge and practice in disaster nursing.

The training in Disaster Casualty Control conducted for newly commissioned nurses at Gunter involves four phases.

I. PHASE I: An indoctrination regarding the composition of nuclear weapons. This is necessary in order for us to understand the medical effects of released energy. In this area the students receive instruction by means of lecture, film and demonstration concerning the four principal medical effects namely: Psychological Effects, Ionizing Radiation, Blast and Thermal Radiation.

A. *Psychological Effects:* Emphasis is placed on the psychological effects because nurses themselves are people. They are subjected to the same fears, anxieties and feelings of inadequacy as other individuals. They are also subjected to all the other effects of a disaster. They are not a chosen breed—They, too, can be killed or injured.

But symbolically the nurse represents a mother figure—someone who offers a haven of protection and alleviates pain and danger. Therefore, in disaster, people will expect the nurse to know what to do. To perform efficiently under duress, we must learn to control our own emotions. We must be trained for disaster so that we will be inoculated against mental disruption. By means of this training we are taught to deal with a predictable environment which is always less fearful than an unknown danger.

Inevitably where you have persons exposed to massive physical destruction, you have emotional casualties due to psychological trauma. The students learn that mass

panic is relatively uncommon but that transient mental disorders occur during or shortly after the impact period. A temporary breakdown of self-control is the characteristic and most frequent psychiatric abnormality noted in traumatic situations. Individuals are dazed, apprehensive, nervous and frightened. The transient mental disorders which occur are discussed with the students and their management explained.

B. *Ionizing Radiation:* Ionizing Radiation is a comparatively new hazard. The signs and symptoms of radiation sickness are studied and the care of these victims discussed. In this area, emphasis is on self-protection.

C. *Blast:* The students are taught the effects of "direct blast"; however, stress here is on the more important effect—"indirect blast"—producing many casualties namely fractures, lacerations and contusions due to falling buildings, flying bricks, glass and so forth.

D. *Thermal Radiation:* Burns will probably account for the greatest number of surviving casualties from nuclear explosions.

In this area, the students receive instruction in the treatment of mass burn casualties. This includes—prevention of shock, maintaining fluid balance, relieving pain and the exposure treatment of burn surfaces.

Nurses know how to prevent shock and relieve pain but emphasis here is on maintaining fluid balance. Nurses, normally, are not required to determine the amount of fluid replacement, but in a disaster situation, with a minimum of personnel available, they would be expected to know the formula for intravenous replacement therapy. Therefore, the students have a review of the "rule of nines" to determine the amount of body surface burned and the "fluid calculation formula."

II. PHASE II: The second phase is concerned with the principles of care of mass casualties. Here we discuss Survival Care and Triage.

A. *Survival Care* includes: first aid, self aid and buddy aid. By now the students understand the effects of the bomb and the probable areas of devastation. They know that in the target zone there remains only death, destruction and desolation. They know that in the area beyond this, there is destruction, disruption and chaos, and this area contains all living casualties with major injuries and burns. The only medical care in this area for some time may be self aid or buddy aid. That fractured leg or severed artery may be their own.

Here the students receive instruction in the five essential steps to master in survival care namely: dressing wounds, controlling hemorrhage, splinting fractures, handling and moving patients and maintaining open airways.

1. Dressings: They are taught that dressings must be simple and made of materials that are available. They must know how to quickly apply various dressings for various injuries—such as injuries of the jaw, sucking wounds of the chest. They learn that large wounds must be immobilized to protect the patient from further injury, hemorrhage and shock. Because of the urgent need for manpower, we emphasize the importance of applying a dressing so that the patient is not incapacitated—i.e., a dressing on the hand so the patient is able to hold a glass of water.

2. Control of Bleeding: We review the proper application of pressure bandages and recommend the use of tourniquets only when this is ineffectual. The use of a tourniquet in a mass casualty situation may well mean the amputation of a limb later on.

3. Fractures: The students are reminded that all fractures must be immobilized before the patient is moved, and they practice applying various kinds of improvised splints.

4. Handling and Moving Patients: Here we stress the importance of quickly examining the patient and that first things come first. Proper positioning and proper transportation are vital if we are not going to cause further injury to the patient.

5. Open Airways: The methods of artificial respiration are discussed and the students are shown the technique of mouth to mouth breathing.

B. *Triage:* "Triage is classifying patients according to priority for treatment and medical evacuation." This requires a high degree of competence and judgment, and it would normally be the responsibility of the most competent doctor available. However, for a time, there may not be a doctor and the nurse may find that she is the senior professional person to carry on triage. We, therefore feel that the students should have some knowledge of the basic principles involved.

The students are made aware of the four sorting classes: minimal, immediate, delayed and expectant. They learn that the first includes those patients requiring minimal care. These patients are given a priority for treatment because of the compelling need for manpower. We must get them back to work. We must divert them from medical facilities and save the medical resources for those patients who actually need them. The second category "immediate" includes those casualties requiring immediate care or life saving measures. The third group "delayed" includes those patients whose treatment may be delayed without loss of life. And the fourth, the "expectant" group are those patients with little chance of survival. The students are given examples of the types of casualties that would probably fall into each group in a mass casualty situation. We emphasize that any plan of sorting must be flexible so that it can be changed to meet any situation. We hope a doctor would be available, but during disaster, nurses might be called upon to do many things which normally are only performed by doctors. Other examples are: debridement under supervision, administering IV medications and simple anesthetics and delivering obstetrical cases.

III. PHASE III: The third phase of our training is application, a practice session in which the nurses participate. This is where the nurses realize their own inadequacy and their need for additional training and practice.

Our problem is a simulated crash rescue. In order to have the training "stick" so to speak, it must be starkly realistic and the nurses must participate.

In a semi-wooded area on the base, we have scattered about the wreckage of a crashed and broken plane. The class of students is divided into "victims" and "rescuers." The victims are issued coverall outfits and realistic moulages representing the type of injury they have sustained—a serious head injury, an amputation, evisceration, fractured limb, sucking chest wound, burns, etc. To add realism, plastic bags of simulated blood are siphoned to the moulages, and the victims are briefed to enact the suffering, moaning, screaming sounds that are part of the terror of a disaster. These victims scatter themselves about the field amid the wreckage of the plane. On signal, the rescue half of the class come up over the hill, accompanied by a field ambulance dashing to the scene of the disaster. The rescuers quickly examine the victims and provide necessary emergency measures. Here the students must not only know what to do but they must demonstrate their powers of decision in a terrifying, screaming scene of suffering on what to do first.

They must recognize those who cannot possibly be saved; those who must be made to rise and walk from the danger area of a possible explosion or spread of fire; those who must be stretcher borne and some whose injuries will be aggravated unless splinting and special carrying procedures are carried out. They must recognize those who are hemorrhaging where mere seconds can be the difference between life and death. As the casualties are brought back to the haven of the ambulance area, they are grouped for immediate or delayed attention. Some can wait —again, others require that immediate or never attention. Field splints are used where indicated; intravenous fluids administered; wounds dressed; hypodermic injections given for those in pain and even a simulated shock psychotic comforted and quieted.

Following the rescue demonstration the class is then assembled for a critique by their instructors. It is a rugged and strenuous operation for victims and rescuers alike.

I have never seen a class which did not deserve to be praised highly for its spirit, but also, I have never seen a class that did not require an explanation and discussion of many, many mistakes. It is a grim, sobering but meaningful learning situation.

Again, by participating in this one realistic disaster situation, the nurses have certainly learned a little—as I said before—they have been exposed, so to speak and they are definitely motivated.

Many of these nurses ask if they will receive more of this training when they arrive at their new assignments. They honestly want to be prepared to function after the bomb falls. How we answer this question concerning additional training actually involves Phase IV of our program.

IV. PHASE IV: During all of this training, the students gain an awareness of the requirement for organizing and planning for disaster.

They are informed that as Air Force nurses, they will have a place in the total disaster plan of the Air Force hospital to which they are assigned. They may function on a triage team, a surgical team, a burn team, etc. Being assigned to a team is just the beginning—In addition each member must be thoroughly familiar with the functions of the team and responsible for additional training. As nurses, they have a responsibility for not only becoming proficient themselves in those techniques they will be expected to perform but also in teaching others in the nursing management of mass casualties.

Planning and organizing a training program in any unit will depend on the situation, the personnel to be trained and the facilities available. Training may be accomplished by means of formal classes or on-the-job methods. At Gunter, we introduce the students to some of the training aids available to help them in their teaching. We also demonstrate the process of preparing their own moulages if funds are not available to purchase those manufactured. They receive a Reading and Film Bibliography of available mass casualty materials.

In regards to on-the-job training, we point out to these students that when making ward rounds with the doctor, they can select those cases that will lend themselves to a mass casualty discussion. For example, they may have a patient with a spinal cord injury. This is a condition that would certainly be seen if a nuclear weapon were detonated. Some points of discussion with the ward personnel might include: How do we recognize this condition? How should this patient be moved and in what position? What are the emergency measures that would have to be taken for this victim?

There definitely is a great deal to be learned "on-the-job" concerning the treatment of disaster victims. I suppose what we really need is a little imagination and study of mass casualty techniques in our work every day.

The students become aware of the host of other people who are vitally concerned with disaster preparedness—our allied medical specialists such as Dietitians, Physiotherapists and Occupational Therapists. They, too, must be equipped to render emergency medical care in the period immediately following the disaster. We emphasize that training for these groups should be practical rather than theoretical and suggest the basic nursing procedures and emergency measures they should be taught.

Even though disaster training is included in all of the courses for officers and airmen at Gunter, each Air Force nurse has a responsibility for additional teaching of the non-professional help in our Air Force hospitals. I believe one of the reasons I am so thoroughly convinced of the necessity for this training of the airmen who are a very important part of the Air Force Medical Service team is because of an incident that occurred to me during the Korean Crisis. I have never been very proud of this story but perhaps it will emphasize the point I made earlier that nurses are people and subjected to the same fears, anxieties and emotional reactions as everyone. We need to be inoculated for disaster.

In the summer of 1950, I was sent to the Far East as a flight nurse to fly the wounded

within Korea and from Korea to Japan. In November of that year, our troops suffered severe reverses north of Pyong yang. and there were thousands of casualties. I was sent with my medical airman to Pyong yang to stay with the 8055 MASH, which was the most forward Mobile Army Surgical Hospital in Korea at that time. From there we were to fly north in a C-47, which was able to land on the short, improvised airstrip at Sinanju and evacuate the wounded back to the MASH. These patients had only a minimum amount of care on the battlefield or in Battalion Aid and Collecting Stations. The flight was approximately 35 minutes, and the first day we made about eight or nine round trips. At dusk, we had to stop because the strip at Sinanju was not lighted for fear of attack by the enemy nearby. However, the second evening we were requested to return after dark because of the urgency to get the mounting casualties back for treatment. In order for the pilot to be able to see for a landing, they lit the strip with smudge pots.

We had landed after dark for our second load, and my airman and I were standing by the cargo door of the plane waiting for our patients to be brought down over the hill in field ambulances, jeeps, trucks and some hand carried. Suddenly, the pilot, co-pilot and engineer dashed past us running toward the side of the field and shouting, "Get under cover, here comes Nite Check Charlie." "Nite Check" was an enemy fighter pilot who had made quite a reputation for himself around Pyong yang—flying in close to the airstrip there and dropping small bombs. The next thing I realized, I was under a six-ton truck parked on the side of the field. I had dashed after the flight crew. We had two of our fighter planes for cover on the field, and they were off immediately. "Nite Check," his bombs dropped at a distance, was gone. Suddenly, I realized that I should be back at my plane and quickly returned to receive my patients. As I arrived at my aircraft, the patients were being loaded aboard, and as I climbed through the cargo door, I saw my medical airman in the process of starting an intravenous. This particular patient was in shock and my airman had already applied a pressure dressing to a hemorrhaging bullet wound in his back. I saw a jeep driver holding an oxygen mask on the face of an unconscious brain injury as instructed by my airman. As I said, I have never been very proud of this story but I did learn and profit from this experience. However, I know that I shall be eternally grateful that I had a fellow team member who was a very well trained airman with his emotions well under control. Otherwise, two of the patients on that plane, who were my responsibility, never would have made Pyong yang.

During its short existence, the Air Force Nursing Service has gone from a world at peace to a world in conflict. Now we are at peace again in a world of unrest with the ever present threat of nuclear attack. We hope that with diligent planning and training we will be prepared this time to meet the emergency that can and may very well happen in the future.

Last year brought the space age, and space travel, a dream only a few years ago, is almost a reality. If nursing involves the whole person and we are going to provide care for the space traveler either at the rocket site prior to take-off or in our base hospital after his return, we must study and learn about the individual's environment. What are the factors to which the space man must adjust? In order to provide optimum care for this patient, we must understand the physical and emotional requirements of his mission.

Several months ago, the Flight Nurse Course was moved from Gunter Air Force Base, Alabama, to the School of Aviation Medicine, Brooks Air Force Base, Texas. In the Division of Space Medicine at this institution, extensive research has been going on for over a decade to determine and solve the medical problems of space travel confronting the man existing in a quasi-terrestrial environment. Many of the problems are now known but the researchers must anticipate all of the problems and determine the answers before space travel becomes a reality.

Once again, we are starting by revising the

Flight Nurse Curriculum in order to include instruction concerning the problems of man existing beyond the atmosphere. If as Air Force Nurses we are going to assist the Physician in caring for the space traveler, we must anticipate the nursing problems now in order to determine the nursing management of the Astronaut when he is entrusted to our care.

In our dynamic society, the task facing the entire nursing profession is to determine the duties nurses will be expected to perform in the future in order to plan their preparation today.

During the past 10 years noteworthy progress has been made in preparing Air Force nurses for immediate and future responsibilities. It is the aim of the Air Force Nursing Service to continue to plan and prepare in order to increase the effectiveness of care provided for each individual patient in our hospitals and flying aboard our planes.

THE FACTS OF '59

37,600 Deaths
900 More than 1958

2,870,000 Injuries
45,000 More than 1958

8,200 Pedestrians Killed
500 More than 1958

914,690 Casualties from Speeding

15,110 Deaths Occurred on Weekends
More than 40% of the Total

28.7% of the Drivers Involved in Fatal Accidents
Were Under 25 Years of Age

More than 80% of the Fatal Accidents Occurred on Dry Roads and in Clear Weather

More than 85% of the Vehicles Involved in Personal Injury Accidents were Passenger Cars

Almost 3,000 Pedestrians were Killed while Crossing Between Intersections.

Methazolamide (Neptazane®) in Glaucoma*

A Report of Twenty-Four Cases Treated

By

CAPTAIN S. SUCHAT, M.D., D.Ophth., F.O.S.T. (Ophth), *Royal Thai Army*

METHAZOLAMIDE† was used in treatment of glaucoma and glaucomatous iridocyclitis in twenty-four outpatients. These cases fell into the following categories: acute chronic, traumatic, aphakic, and secondary to senile intumescent cataract. Eight of the patients were male and sixteen were female, with ages ranging from 28 to 82 years.

At each visit the patient's ocular tension was taken with the Schiøtz Tonometer and the patient was questioned about any subjective symptoms.

The dose of Neptazane used was 100 mg. which was taken three times a day after meals. Seven of the twenty-four patients did not respond to treatment with that drug. Four of these seven, however, did respond to Diamox therapy; the other three were transferred for surgery. Of the twenty-four patients six had been classified as failures on Diamox and were given Neptazane with success. There were two cases that did not respond to either Neptazane or Diamox and were transferred to surgery.

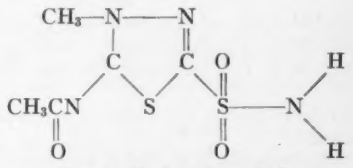
DISCUSSION

Neptazane seems to be effective in controlling the intraocular pressure in cases of glaucoma and shows much less renal and systemic electrolyte alterations but does have similar ocular effects to those induced by other carbonic anhydrase inhibitors.

The optimal dose of Neptazane was found to be 100 mg. three times a day after meals. In those acute cases we used in addition a 4% pilocarpine nitrate solution instilling one drop every hour for the first six hours, then one drop every four hours. In chronic cases the drug was used twice a day in 100 mg. dose with a 2% solution of pilocarpine nitrate being used—one drop four times a day.

Patients 19 and 21, who developed acute congestive glaucoma, were unsuccessfully treated with either Neptazane or Diamox and the 4% pilocarpine solution. Eserine salicylate—¼ per cent solution—was tried, instilling one drop every thirty minutes for two hours, but the intraocular pressure remained elevated and the fields showed progressive loss so emergency surgery was done. This was a corneoscleral trephine operation. I might say that I do not use DFP—di-iso-propyl fluorophosphate (0.05% in peanut oil), as I consider it dangerous in these conditions.

Neptazane is a carbonic anhydrase inhibitor with an in vitro potency of about 1.3 to 1.6 times that of Diamox (acetazolamide). The formula is:



(5-acetylimino-4 methyl 2-1,3,4—thiadiazoline-2-sulfonamide)

CONCLUSIONS

Neptazane appears to be useful in those who developed chronic simple glaucoma, glaucoma secondary to senile intumescent cataract, and aphakic glaucoma.

We found the effective therapeutic dose to be 100 mg. given two or three times a day after meals.

Neptazane produces less toxicity than any other group of carbonic anhydrase inhibitors, even in prolonged use.

* From the Department of Ophthalmology, Pra Mongkutklao Hospital, Phyathai Palace, Phyathai, Bangkok, Thailand.

† We are indebted to the Lederle Laboratories, American Cyanamid Company, U.S.A., for the Neptazane used in this study.

TABLE 1

24 PATIENTS TREATED; INTRAOCULAR PRESSURE MEASURED WITH SCHIØTZ TONOMETER

Patient No.	Age	Sex	Diagnosis	Ocular tension in mm.Hg (with 7.5 gm. wt. unless otherwise stated)	
				Before Neptazane	After N.
1	58	M	Chronic simple glaucoma, O.U.	34/30	25/22
2	66	F	Acute congestive glaucoma, O.S.	24/42	20/23
3	56	F	Chronic simple glaucoma, O.U.	30/37	22/22
4	48	F	Glaucoma simplex, O.S. Glaucomatous Iridocyclitis, O.D.	32/46	30/42**
5	62	M	Glaucoma after cataract extraction, O.S.	21/40	21/40**
6	54	F	Chronic simple glaucoma, O.U.	32/37	20/22
7	56	F	Chronic simple glaucoma, O.U.	30/34	19/23
8	70	M	Chronic simple glaucoma, O.U.	30/32	22/22
9	63	M	Glaucoma secondary to senile intumescent cataract, O.D. Glaucoma simplex, O.S.	58/28	58/28***
10	66	F	Glaucoma simplex, O.U.	32/30	24/22
11	56	M	Aphakic glaucoma, O.D.	37/24	37/24**
12	68	M	Acute narrow angle glaucoma, O.D. Chronic simple glaucoma, O.S.	62/50	62/50***
13	50	F	Chronic simple glaucoma, O.U.	37/32	37/30
14	53	F	Glaucomatous iritis, O.S.	24/46	20/22
15	58	M	Chronic simple glaucoma, O.U.	32/30	23/21
16	28	M	Traumatic glaucoma, O.D.	40/24	37/24***
17	60	F	Glaucoma secondary to senile intumescent cataract, O.S.	21/34	18/21
18	66	F	Aphakic glaucoma, O.U.	37/34	25/23
19	58	F	Acute Congestive glaucoma, O.D. Glaucoma simplex, O.S.	0/38 (7.5) 72/48 (10 gm.)	 ††
20	82	F	Chronic simple glaucoma, O.U.	34/30	22/20
21	70	F	Narrow angle glaucoma, O.S.	0/38 (7.5 gm.) 77/52 (10 gm.)	††
22	62	F	Glaucoma simplex, O.U.	30/32	30/32**
23	48	F	Acute anterior uveitis with secondary glaucoma, O.D.	46/25	25/23
24	56	F	Open angle glaucoma, O.U.	43/37	23/19

** Patients Nos. 4, 5, 11, and 22 were unsuccessfully treated with Neptazane and were transferred to Diamox.

*** Patients Nos. 9, 12, and 16 were transferred for surgery.

†† The ocular tension was still high; immediate surgery was performed, O.D.

EDITORIALS

Malaria

WE, IN THE United States, are many times blessed; one of the blessings is the almost complete eradication of malaria in our country.

Within the memory of many still living are those cases of malaria with its chills, fever and sweats occurring at periodic intervals. The victims made the best of living with their big spleens and the plasmodia and fought the disease with the only drug known at the time—the alkaloid of the cinchona bark—quinine.

Needless to say, the discovery of that drug was one of the highlights in medicine. For years it was the only drug available.

World War II came. Malaria caused a terrific loss of manpower in our forces in the Pacific. An intensive drive against the disease had to be made, and such was the force behind the movement to reduce the number of casualties from malaria that new drugs were developed as well as insecticides and means for using them. The result was a decrease in the malaria rate in the Armed Forces. That shows what can be done when enough get behind a project.

While we have practically eradicated malaria in the United States the rest of the world has not been so fortunate.

The means for the eradication of this disease are known but still there are problems other than the taking of drugs and the spraying of areas with insecticides. Ignorance must be overcome; cooperation must exist. While these deterents are not insurmountable it will take years to overcome them—at least it will in some countries.

Dr. Abraham Horwitz, Director of the Pan American Sanitary Bureau, Regional Office of the World Health Organization, in Washington, D.C., has made a plea for the eradication of malaria in the Americas. It would seem logical that we of the Western Hemisphere should attack this problem with great energy. We, who in the not too distant future will be travelling by motor vehicle from the most northerly part of North America to the tip of South America. Portions of this journey would be made through malaria infested regions. Of course, the individuals can take along mosquito nets, their insecticides, and their spraying equipment, and their drugs. But what of the natives in the areas?

Here is a challenge for each country of the Americas. The challenge can be met by educational programs. All levels of society will have to be reached. Programs for the eradication of malaria will have to be continuous ones; not those of great intensity for one year and then of laxity the next year. The rural population particularly will have to receive a great deal of attention. Insecticides, drugs, education, and every means known will have to be used.

Malaria will disappear in the Americas as the interest in its disappearance is manifested. That is true for the rest of the world, too.

TO THE EDITOR

This letter is in reference to the article "Reduction and Fixation by Pinning 'Banderillero' Style-Fractures of the Humerus at the Elbow in Children" by Emmanuel Casiano, M.D., in the April 1960 issue of MILITARY MEDICINE.

Many articles on the treatment of this type of fracture have been published in the orthopedic literature and it is the consensus of opinion of experienced orthopedists that indications for surgery in this type of fracture are rare and the greater the orthopedist's experience with this type of fracture the less likely he is to resort to open reduction. Too often the surgery is prompted by the parents' or the surgeon's anxiety in an attempt to treat the x-ray picture; and too often the operation is a reflection of the orthopedist's lack of understanding of what

represents a satisfactory reduction and the child's ability to remodel a diaphyseal fracture.

The superacondylar fracture in children is so common and may have such serious sequelae that any discussion of it should be backed by a wealth of experience.

Certainly if any operative treatment is proposed it should be supported by very positive arguments and any indications for such surgery should be enumerated in detail.

MAJ. PAUL W. BROWN, MC, USA
Chief, Orthopedic Section, and
Chief of Surgery, U. S. Army Hospital
Sandia Base, New Mexico

A CORRECTION

A correction should be made in the article "Progressive Patient Care—A Challenge for Nursing" by Faye G. Abdellah, R.N., Ed.D., MILITARY MEDICINE, Vol. 125:331-337, May 1960.

The first sentence of paragraph 3 should read "Progressive Patient Care is not a *new* concept." The word "new" was omitted.

HEALTH-USA AWARD

Major General Howard McC. Snyder, physician to the President of the United States; Elmer H. Bobst, chairman of the Board of Warner-Lambert Pharmaceutical Company, and Donald H. Stubbs, M.D., chairman of the Board, National Blue Shield, were recipients of the 1960 Health-USA Award, co-sponsored by the Metropolitan Washington Board of Trade and the Medical Society of the District of Columbia. Presentation of the awards was made on May 19 at the Statler-Hilton Hotel in Washington, D.C.

General Snyder, who entered the military service in 1907 and who has been a member of the Association of Military Surgeons for over forty years, spoke of his graduation from medical school in 1905 and of the great service that medicine can give to the people through the intense interest the physician develops in the welfare of others.

A capacity audience of over 600 people was present at the affair.

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Around the World

(Ser. III, No. 21)

By
CLAUDIUS F. MAYER, M.D.

UGANDA, or the *Uganda Protectorate* is an inner mountainous country in East Africa, situated at Lake Victoria, between Kenya on the East, the Belgian Congo on the West, the Sudan on the North, and Tanganyika on the South. Its boundary lines run through a number of great lakes (the Lakes Victoria, Edward, Albert, Rudolf). The whole area is somewhat less than 100,000 sq. miles. Although one seventh of the area is water, the nearest point to the sea is 490 miles away. Administratively it has an eastern, a northern, a western province and the central province of Buganda. The country has a governor, and an Executive Council of ministers, and a Legislative Council. The population is about 5½ million, among them 54,000 Asians (Indians) and 8,400 Europeans. The main towns are Kampala, where the native African king (called the "kabaka") resides, Entebbe, Jinga, Gulu, and Fort Portal. The country has more or less the institutions and the *token signs of western civilization.* There are hotels, electric lighting, a battalion of the King's African Rifles for defense, police, one English and several vernacular daily papers, civil and criminal law with codes based upon English law, railway lines, navigation on steamers of various companies, all-weather roads for private autos, and bus service, air service, etc., etc., including the system of income tax, poll tax, education tax, and juvenile delinquency. The currency is the East African shilling.

The inhabitants are of the Bantu, the Nilotic and the half-Hamite races. Their principal language is the Luganda, though many other languages are also used at different sections of the country. The people are half pagan, half Christian, with quite a large group of Moslems, too. Until 1924, the *African education* was left entirely in the hands of missionary societies. In 1925, an Education Department was formed. The post-secondary education is provided by the *Makerere College at Kampala,* which is the University College of East Africa. The College has over 800 students, and it has a special relationship with the University of London. There are many other technical schools, and training colleges, all maintained by the government.

The *climate of Uganda* is tropical, yet rather pleasant near Lake Victoria. The seasons are represented by wet and dry periods. The vegetation is luxuriant, with huge forests. The country is being gradually industrialized, and provided with hydroelectric power. Agricultural products (cotton, coffee) as well as minerals provide wealth by export. The agriculture also suffices to supply the diet of the native population, including also the production of commercial fisheries. Hunting is carried out on a large scale, partly by the casual visitors, so that the government was forced to establish special sanctuaries for some rarer large animals. There are for instance three gorilla sanctuaries, also asylums for white rhinoceros, for elephants, for hippopotamus, etc.

Uganda's health conditions are satisfactory. Malaria occurs in all parts of the country below 5,000 to 6,000 feet; mosquito nets should be used and prophylactic drugs taken, except in the larger towns. The incidence of plague, smallpox, and of other tropical diseases is low. Once, the country was a place of epidemics of sleeping sickness. The sanitary conditions in Uganda are generally good. Piped water is available in the majority of the towns, but all drinking water should be boiled. It should also be remembered that the fish and the water of the great African lakes are natural reservoirs for dysentery bacilli. Milk should also be boiled, unless pasteurized,

and vegetables or fruit should be eaten only after being washed.

There are 23 government *hospitals* (general) *in Uganda* situated in the towns, and some 200 dispensaries and aid-posts in the rural areas. High-grade medical facilities are provided at Kampala, Jinja and Mbale. The mission societies are also maintaining some hospitals and rural units, such as the hospital at Namirembe, and one at Nsambya. Not so long ago, Uganda's health was still in the hands of hereditary sorceresses who for generations used to have their headquarters in a forest near Mubende, under a giant tree which is still one of the local sights of the kingdom of Buganda (the *"Witch Tree"*).

It has been observed that *carcinoma of the urinary bladder* is very frequent in African males and females who are living *in Moçambique* as compared with other parts of Africa. Perhaps Egypt is the only other African country where bladder carcinoma also has a very high incidence. A recent study from the Miguel Bombarda Hospital at Lourenço Marques shows that by the time the Portuguese African patient is admitted to the hospital the carcinoma of the bladder has reached an advanced stage, often with numerous metastases in the region and in the liver, lungs, kidney and other organs. The bladder carcinoma, which is predominantly of the squamous cell variety, occurs at a much earlier age in Moçambique than in America. It is most likely that schistosomiasis is important for the development of this type of cancer, yet the role of it is not a direct one in the etiology of bladder cancer in Portuguese East Africa.

Small doses of *ionizing radiation* have been blamed for an increased *incidence of cancer* all over the world. There are also a few data for mortality from bone cancer as a function of terminal radium burden. The available data relating to human osteogenic sarcoma are scanty at the present time. Some authorities are inclined to state that the low doses of radioactive isotopes received by human beings from *world-wide radioactive fallouts* will not induce osteogenic sarcomas (according to some estimates, there are only ten cases of osteogenic sarcoma per annum per million of population).

This fear of radioactive fallout has resulted in a service to be provided by the *International Atomic Energy Agency.* That agency will undertake, in the near future, measurement and *analysis of samples of air,* water, soil, and food for the determination of the degree of radioactivity in man's environment. The laboratory where this work will be done is to be built near Wien, Austria. The Agency will also help in establishing the international standards of sampling, of measurement and analysis.

Another related protective agency is the *International Civil Defense Organization* which has its headquarters in Geneva, Switzerland. Its particular task is to act as a clearing house of technical information in the field of civil defense in 90 countries. The work of the organization is carried out in a humanitarian spirit and on a basis of strict neutrality. The organization planned the Fourth International Civil Defense Conference in the fall of 1958 in Paris, and arranged an exhibit in which radioactive measuring instruments, fire-fighting equipment, rescue and first-aid material were shown. The organization also publishes a Bulletin, now in its seventh year; it always contains maps which show the radioactive fallout over Europe.

The Institute for Jewish Affairs of the World Jewish Congress made a sort of *census of the Jewry of the World.* According to the published statistics, 12,082,000 Jews are living on the whole Earth. Their distribution is as follows: 5,200,000 Jews are in the U. S.; 976,000 in the rest of the Americas; 3,273,000 in Europe (of whom 2 million are in the U.S.S.R.); 1,822,361 in Israel, and 184,039 in the rest of Asia; 560,000 in the whole of Africa (of whom only 2 are in Basutoland); 64,500 in Australia. There are no Jews in Jordan, in Saudi Arabia and Mauritius.

A recent study of the *National Institute of Statistics in France* brought out the surprising fact that, with the exception of the tumors and of leukemia, the conventional diseases are

on the decrease in "la belle France." People died of influenza, of tuberculosis; in general the mortality is higher in the areas of the wine industry. Yet, even the victims of alcoholic cirrhosis have diminished. The number of tumor victims is growing. The incidence of tumor is 1.97 per 1000 among men, and 1.75 per 1000 among women. While the fatalities from disease are decreasing, the *number of violent deaths* is growing in France. More people committed suicide in 1958 (7391) than in 1957. (That reminds us of the *Eiffel Tower*, a favorite spot to commit suicide in Paris. It was built in 1889, and since then 236 persons have jumped off its first platform, 61 from the second, and 6 from the third.) The male suicides are twice as frequent as the self-killing among women. The number of murders has also increased, and so has the deaths from accidents (26,180), especially in the 50-59 age group. Generally, the women are more resistant to diseases than the men. More Frenchmen die in the spring than in the summer.

In Augusta, Italy, the 26th course of the *International School of Missionary Medicine* opened last December at the Ospedale di S.Giacomo. This school started some 25 years ago, and now it is under the patronage of the Sovereign Order of Malta and of the United Hospitals of Roma. The course of missionary medicine takes two years, and its teachers are the medical staff of the hospital and some outside specialists.

Latin people everywhere in the world are feeling the urgent need of closer cultural, scientific and economical connections. For the promotion of this aim, a new agency was created, with headquarters in Roma. It is called the *Center of Latin Action*, which has a direct collaboration of the embassies of all Latin people of the world accredited by the Italian government. The ultimate aim which the Latin Action expects to reach is the resurrection of the essential values of Latin and Christian citizenship in the education, culture, society, labor, sciences through the integration of all spiritual and material resources of the participating Latin countries.

A few years ago it was suggested that an appreciable amount of *endemic goiter in Australia* (especially in Tasmania) might be due to a goitrogen present in the milk of cows fed "chou mollier." Indeed, extracts of this cruciferous weed will depress the activity of the thyroid gland, and samples of milk from these goiter areas were also found to be goitrogenous. A recent study of the Biochemical Department of Melbourne University showed that extracts of the seed of turnip weed (*Rapistrum rugosum*), which is in abundance on the pastures of Queensland, contain a thioglucoside which is cheiroline (contained also in the seeds of the wallflower, *Cheiranthus cheiri*). Experiments proved that this substance will cause goiter.

Last October (1959), the Royal Society of Medicine held a meeting on one of the most urgent medical problems of our times, atherosclerosis. The *Symposium on Atherosclerosis* brought out the fact that those who consider this ailment a static condition of the vessel walls are in error. All the morphological studies point to a constant state of flux in the lesions, with variations in the amount and distribution of lipids, deposition and incorporation of fibrin, intimal vascularization and sclerosis, all proceeding side by side. It is this *state of plasticity* of atherosclerosis which gives hope of influencing the course of the disease (T. Crawford). The Symposium also corroborated the previous findings that the role of plasma lipids (high cholesterol values) in the origin of atherosclerosis is not quite certain. Especially in the older patients such blood findings have little diagnostic significance. Heart infarction can develop even with relatively low blood cholesterol. Apparently, hereditary and environmental factors are in a complicated interrelation in the origin of atherosclerosis and/or coronary disease. These are certainly not identical with each other.

The role of *acute stress in coronary heart disease* is looked upon with askance. Yet, it is true that a number of younger patients with coronary attack, especially those under 40 years of age, become sick after severe emotional stress. Some evidence is also available that acute emotional stress causes objective

changes in the chemistry of the blood and in the coagulability of the blood. Pressure of work on accountants at time of tax returns, when they have to work within a deadline, will cause their blood cholesterol's rise and their clotting time's acceleration. These changes are independent of variations in weight, diet and physical activity. Similar chemical changes are also detected in people who are continually in *competition with others,* and are working against time. These changes may be mediated by increased secretion of adrenalin, and, indeed, the corticoid drugs are also raising the viscosity and coagulability of the blood. These observations are apt to open new paths in the research and therapy of coronary disease.

Gregorio Marañón, professor of endocrinology at the University of Madrid, died a few months ago (1887-1960, March). In addition to his study of the endocrine glands and sex hormones, he also was interested in history, and he used the method of "psychobiography" to describe such historical personalities as Tiberius, Henry IV of Castile, Antonio Pérez, etc.

There are several *medical societies in Jugoslavia* with a total membership of 6376. A separate society is for the Serbs, one for the Croatians, one for the Slovenians, the Bosnians and Herzegovinans, and also one for each group of doctors in Macedonia, and in Montenegro. These seven societies form a Union which takes an active part in the organization of the Health Service of the country, including the preparation of sanitary laws, the regulations for specialties, the control of medical conduct, the control of the number of medical students (numerus clausus), the control over hospitals and medical positions. The Union itself publishes six medical periodicals, yet there are about 50 medical serials in Jugoslavia, among which the oldest are the "*Srpski arhiv za celokupno lekarstvo*" (1872-) in Beograd, and the "*Liječnicki vjesnik*" (1877-) in Zagreb.

In *Bulgaria, medical education* is almost entirely the responsibility of two medical universities (formerly called medical academies) in Sofia and Plovdiv. Before World War II, only the Sofia school existed, and many Bulgarians went to foreign lands for medical instruction. Now, only few travel abroad. The *Medical University Institute at Sofia* has three faculties, one for each of the following: —medicine, stomatology and pharmacy. At Plovdiv, the school is entirely for medical education. While in 1944 the number of physicians was 3156, now there are 10,183 (in 1957) physicians practicing in the country. This is a doctor-patient ratio of 1:756. The number of dentists also increased from 824 to 2300, while the pharmacists' group has grown from 695 to 1280. Postgraduate education of physicians and dentists is carried out at a special Postgraduate Educational Institute in Sofia, and at the many specialist clinics of the Medical School, hospitals, dispensaries for tuberculosis, for tumors, for NP and dermatovenereological patients. Pharmacists are also getting some postgraduate instruction at the Sofia school in recent years. A few doctors find the opportunity to improve themselves at the various research institutions. The education of the auxiliary medical personnel (midwives, feldshers, nurses, technicians of mostly the female sex) goes on in 17 other schools (in 1944 only 4 such schools were functioning).

Hospital facilities spread so much *in Albania* that in 1955 there was a bed available for every 380 persons (in 1938, the ratio was 1:1270). The number of therapeutic and prophylactic medical installations grew to 974 (from 48). The general health of the population improved, which is shown by the great changes in the *mortality rates from particular diseases.* Comparing the 1955 situation with the conditions in 1948, the mortality from gastro-intestinal ailments decreased by 80%, from diphtheria by 30%, and from exanthematic typhus fever by 100%. Before the "liberation" some 100 physicians were working in Albania. In 1958, 204 physicians, 465 middle cadre personnel, and 852 nurses were providing medical service to the Albanese. In 1952, Tirana opened *a medical school* which in 1957 graduated its first doctors.

Tsing-Tao, on the Yellow Sea, opposite South Korea (inhabitants 917,000) became a favorite *health resort of the Chinese* communists. Villas of the former owners were changed into sanatoria and rest homes. The climate of this town is mild throughout the year. There are mountains in the neighborhood, natural mineral springs, and good bathing facilities. There are now 12 big sanatoria with over 3000 beds for several trade unions. The Red China Government spent a lot of money on changing the town into a big park. The Tsingtao Sanatorium has an indoor year-round sea-water swimming pool, one of the very few in East Asia. Among its facilities, there are some for "wax therapy," and acupuncture, and for "traditional Chinese massage." Another sanatorium is in the nearby Laoshan mountains for tuberculosis. The hot springs of this region are recommended for rheumatism. Workers stay in the sanatoria without charge, and receive full pay during their resting there.

Due to the efforts of Aldo Masturzo, M.D., there is now an *International Cybernetics Medical Society.* It was established in 1958, with the participation of 19 countries. Last November, the Society held a general meeting at Napoli, Italy, in the large auditorium of the Naval University of the city. Nayrac, of Lille, asserts that only cybernetic medicine is able to establish the synthesis of the innumerable data which come from the researches. Such a synthesis is possible in a coordinated system of *mathematical logics.* Masturzo, who is temporary president of the Society, pointed out that there are many advantages in applying cybernetics to medical research. By this new method of investigation it was, for instance, detected that rheumatism is the sequela of "an informational error at a point of the neurovascular circuit" (NOTE: Masturzo is a rheuma specialist). This group of physicians expects that by their efforts medicine and biology might become exact sciences. The second congress will be held again in Napoli this year.

For centuries, Hungary was famous for mathematicians. Some of them worked on practical problems, making machines which could play chess. Others worked out complicated theories to cause revolution in mathematics and geometry. In the past 4-5 years, groups of *Hungarian mathematicians made an alliance with physicians* and biologists to promote the *research in cybernetics.* They divided the field between themselves, and between their universities at Budapest, Szeged, Pécs, and Debrecen. Some of these mixed teams work on computer-type machines. Others wish to create logical machines, artificial brains which are expected to answer more than whether a statement is "true" or "false." Some of them expect that the Pavlovian concept of the two-fold *signal function of the human brain* will also allow the construction of such mathematical machines which will be able to draw conclusions from experimental findings in a syllogistic way. Are they ultimately on the way to manufacture robots? One of the Hungarian mathematicians made a small mathematico-biological machine which he called a "*lady-bug.*" Others in the mixed teams created strange monstrous animals by regrafting the organs to unusual sites of the body (e.g., the leg of a chicken to its back) to see how the stimuli run from it to the central nervous system, and back. Thus, cybernetics has many interesting bio-medical aspects, but we cannot help wondering how and when the Great Magician's apprentice will be punished for his prying into the Book of Secrets of his Master.

Here is the sentimental story about *a valiant mule* who won the highest Italian award for gallantry. The mule died an honored veteran's death at the stables of the Vicenza Mountain Artillery Group at Vipiteno, in southern Tyrol. The mule was known as "*Valoroso*"; because of its distinguished conduct during the battle of Nikolaikeva between Soviet and Italian troops in January 1943, the pack animal was awarded the Gold Medal for Valor. During a raging snowstorm, in the midst of the battle, the mule disappeared. Ten days later, it returned to the Italian lines, still carrying a gun barrel on its back! . . . *Multa paucis*!

NOTES

Timely items of general interest are accepted for these columns. Deadline is 1st of month preceding month of issue.

Department of Defense

Ass't Secretary (Health & Medical)—HON. FRANK B. BERRY, M.D.

Deputy Ass't Sec'y—HON. EDW. CUSHING, M.D.

INDUCTION

The July induction by the Selective Service System calls for 6000 men for the Army.

MEDICAL SUPPORT FOR CHILE

Earthquake strikes Chile. U. S. is called on for assistance. U. S. responds.

Ready to go medical units were called out to give medical aid to the earthquake area in Chile. This area, as far south of the equator as Pittsburgh is north of the equator, suffered a tremendous loss of life and property and the toll of injured amounted to many thousands. This was not a one tremor affair but subsequent shocks were felt for days after the initial heavy one.

The units dispatched to the area were the STRAC 7th and 15th U. S. Army Field Hospitals, as well as water purification and laundry units, communications personnel, and linguists of the 519th MI Battalion.

In addition to the Army personnel, numbering well over 500 doctors, nurses, corpsmen and supporting specialists, large quantities of medical supplies were airlifted to the disaster scene through joint Army-Air Force efforts.

Army

Surgeon General—LT. GEN. LEONARD D. HEATON

Deputy Surg. Gen.—MAJ. GEN. THOMAS J. HARTFORD

CHIEF NURSE GREEK ARMY VISITS USA

Lt. Colonel Cleopatra Avayanou, the organizer and chief of the Queen Frederika Nurse Corps of the Greek National Army, visited the United States recently to become acquainted with the nursing problems in our Army, Navy, and Air Force hospitals. She speaks French fluently and has an understanding of English.

Colonel Avayanou has been active in military nursing circles since she was commissioned in 1932. Throughout her career she has held many important positions in the Greek Red Cross, and has been particularly active in training student nurses. In 1949 she was also placed in charge of the Queen Frederika Military Nursing School where students study nursing for three years at government expense and then serve as nurses for 10 years in the Queen Frederika Nurse Corps.

U. S. Army Photo

LT. GEN. LEONARD D. HEATON, Army Surgeon General; LT. COL. CLEOPATRA AVAYANOU (center), organizer Nurse Corps, Greek National Army; COL. MARGARET HARPER, Chief, Army Nurse Corps.

RECEIVE MASTER DEGREE

Three officers of the Brooke Army Medical Center received the Master degree in June. Lt. Colonel Anthony Urbine, MSC, Army

Medical Service School received the Master of Arts degree.

Captain Shirley C. Gluck, Brooke General Hospital, received the Master of Education degree.

Captain Alfred Quartin, Army Medical Service School, received the Master of Education degree.

NURSE ANESTHETISTS GRADUATE

Following the completion of a one-year course, six nurses of the Army and Air Force graduated recently from Walter Reed General Hospital's School of Anesthesiology. Certificates of graduation were presented to them by the Commanding General of the Walter Reed Army Medical Center, Major General C. F. St. John.

U. S. Army Photo

(L to R) 1ST LT. LEONARD WILLIAMS (to Tripler Gen. Hosp.); LT. COL. RUTH P. SATTERFIELD, course director; 1ST LT. SALLY MULLEN (to Army Hosp. Ft. Campbell, Ky.); 1ST LT. RICHARD KARWOSKI (to Valley Forge Gen. Hosp.); GENERAL ST. JOHN, CG WRAMC; CAPT. ELEANOR GALLAGHER (to Martin Army Hosp.); CAPT. ELISA CAMACHO-HERNANDEZ (to Army Hosp., Ft. Carson, Colo.); CAPT. JACQUELINE BRODIE (to Keesler Air Force Base, Miss.); COL. HARVEY C. SLOCUM, Chief of Anesthesiology, WRGH.

MORE CREDIT FOR RESERVE NURSE CORPS

More credit will be given for educational background in appointing professional nurses to the Army Nurse Corps Reserve.

A Bachelor of Science degree may be substituted for 18 months of appropriate professional nursing experience; a Master of Science degree for three years of nursing experience; and a Ph.D., or comparable degree for four years of nursing experience. Previously these degrees could be credited for only one, two, and three years of experience respectively.

Now the Army will grant a reserve commission as a first lieutenant for example, if the qualified applicant has either three years of nursing experience, or a bachelor's degree in nursing plus 18 months of nursing experience (a total of three years "equivalent" experience), or a master's degree with no previous nursing experience.

Applicants for reserve commissions in the Army Nurse Corps may be appointed in the grades of second lieutenant through lieutenant colonel.

The minimum number of years of actual or "equivalent" experience required for appointment in these grades is unchanged: less than 3 years for second lieutenant, 3 years for first lieutenant, 7 years for captain, 14 years for major, and 21 years for lieutenant colonel.

TULAREMIA VACCINE

Tularemia (rabbit fever), an infectious disease affecting rodents and transmitted to man through his handling of the rodents, is accompanied by considerable morbidity and about 5% mortality.

A vaccine has been developed at the U. S. Army Biological Warfare Laboratories through the efforts of Doctor H. T. Eigelsbach, J. J. Tullis, W. R. Griffith, and Lt. Colonel E. L. Overholt. The vaccine can be administered by skin or by inhalation.

RECENT DEVELOPMENTS

An autoclave that uses gasoline impregnated wax has been developed for field use. This will do away with liquid gasoline with its hazards in transportation and use in a pressure tank at the aid station.

Another development at the Hunter Lig-

U. S. Army Photo

FIELD AUTOCLAVE USING GASOLINE IMPREGNATED WAX FUEL

U. S. Army Photo

Infrared binoculars enable aid men to work in darkness. Sp 5 J. M. GOOCH bandages PFC J. D. STREETER.

gett Military Reservation in California are the infrared binoculars which will enable Medical Aid Men to locate casualties, render first aid, and evacuate the wounded during the hours of darkness.

JOINS TOBACCO RESEARCH COMMITTEE

Lt. Colonel J. Morrison Brady, MC, USAR, has been appointed as an Associate Scientific Director of the Tobacco Industry Research Committee. He will share with Dr. Little and Dr. R. C. Hockett the responsibility for the administration of the expanding program of grants-in-aid for research into tobacco use and human health.

Dr. Brady, a native of Marysville, Washington, and a graduate of Northwestern University Medical School, served with the Army Medical Corps during World War II. He holds a Master of Science degree in Pathology.

Offices of the Tobacco Industry Research Committee are at 150 East Forty-second Street, New York 17, N.Y.

WATER PURIFICATION UNIT

A water purification unit capable of producing 1500 gallons of potable water each hour from turbid streams that might even be contaminated with radiological substances has been developed by the Army Engineer Research and Development Laboratories, Hunter Liggett Military Reservation, California.

The unit is mobile, can be transported

U. S. Army Photo

quickly over land, by rail, and even air dropped. This is a departure from the previously large complex units that were used.

With this unit a distressed area with 14,000 persons was provided with drinking water for nine days.

VETERANS ASSOCIATIONS

Information is desired by the Organizations and Industry Branch, Office of the Chief of Information of the Army, on the following Veterans Associations: 11th Airborne Div., 38th Inf. Div., 75th Inf. Div., 81st Inf. Div., 90th Inf. Div., 92nd Inf. Div., 95th Inf. Div., 96th Inf. Div., 12th Army Group and Ninth Army Associations.

If anyone has any information on the above associations the Army would like to have it.

Navy

Surgeon General—REAR ADM. BARTHOLOMEW W. HOGAN

Deputy Surg. Gen.—REAR ADM. EDWARD C. KENNEY

HONORED

Captain Ashton Graybiel, MC, USN, Director of Research of the U. S. Naval School of Aviation Medicine, Pensacola, Florida, was recently presented the Admiral William S. Parsons' Award for Scientific and Technical Progress for 1960. The award is made each year by the Navy League Award Board to a Naval Medical Officer.

Dr. Graybiel has earned an international reputation for his work in the fields of cardiology and aviation medicine. He was medical officer in charge of the now famous Able/Baker monkey flight.

ASSIGNMENTS BUMED

Captain James T. Ashwell, DC, USN, has been assigned to the Bureau of Medicine and Surgery in the Standards Section, Professional Branch, Dental Division.

Captain Edward C. Raffetto, DC, has been assigned as Head, Personnel Branch, Dental Division.

RETIRED

Recently retired: From the Medical Corps, U. S. Navy: Captains A. C. Abernathy, C. F. Gell, J. V. Land, and S. M. Smith; from the Medical Service Corps: Lieutenant Commanders Lonnie D. Farmer, D. O. McAllister, and Arvin Cearley.

Air Force

Surgeon General—MAJ. GEN. OLIVER K. NIESS

Deputy Surg. Gen.—MAJ. GEN. JOHN K. CULLEN

SCHOOL OF AVIATION MEDICINE ASSIGNMENTS

Dr. E. Staten Wynne, a bacteriologist from Houston, Texas, and Dr. Arthur V. Montgomery, a toxicologist and a native of Beeville, Texas, have joined the School of Aviation Medicine, USAF Aerospace Medical Center, Brooks Air Force Base, Texas.

Dr. Wynne has been named Chief of the Department of Microbiology-Cellular Biology, and Dr. Montgomery, Chief of the Department of Physiology-Biophysics. Both departments are part of the School's Medical Sciences Division, headed by Dr. Roland B. Mitchell.

These appointments were recently announced by the Commander of the USAF Aerospace Medical Center, Major General Otis O. Benson, Jr.

SEVEN BLOOD EXCHANGES

In the May issue of MILITARY MEDICINE we told of the baby Morado case at Fort Ord, California, in which the child received six complete blood exchanges because of an Rh incompatibility.

We now learn of the case of Jill Brown, born at the U. S. Air Force Hospital, Wright-Patterson Air Force Base, Ohio, and the need for *seven* complete blood exchanges.

Colonel J. W. Humphreys, Commander of that hospital, reports:

"Jill Brown was born of a mother who had an Rh incompatibility and whose pregnancy was complicated by a rising anti Rh titer in

the maternal serum. Premature induction of labor was elected at birth. Hyperbilirubinemia was noted immediately and an exchange transfusion was then performed. Six additional complete blood exchange transfusions were required, making a total of seven. In addition to this, because of secondary anemia, three booster transfusions were performed. To our knowledge, this is the greatest number of exchange transfusions performed on a child with Rh incompatibility.

"The key to the success of this endeavor was the teamwork displayed by the obstetrical, pediatrics, surgical and laboratory staff. The result was most gratifying. The girl is now four months old and developing normally."

A photograph of a beautiful baby accompanied the Colonel's letter.

RECENT RETIREMENTS

The following named officers recently retired from the Air Force Medical Service: Colonel John A. Booth, USAF, MC; Majors John Dillman and Thomas R. Haworth, USAF, MSC.

Public Health Service

Surgeon General—LEROY E. BURNEY, M.D.
Deputy Surg. Gen.—JOHN D. PORTERFIELD, M.D.

APPOINTMENT

Dr. Robert J. Anderson has been appointed deputy chief of the Bureau of State Services, Public Health Service. He succeeds Dr. Theodore J. Bauer who became chief on July 1.

Dr. Anderson has been chief of the Communicable Disease Center in Atlanta, Georgia, for the past four years. He is a graduate of the University of Minnesota School of Medicine, and holds a Master's degree in public health from Columbia University. Following an internship at the Public Health Service Hospital in Staten Island, New York, he was commissioned in the Public Health Service (1940).

As deputy chief, Dr. Anderson will assist in the administration of the Public Health Service programs that deal with the control of chronic and communicable diseases and the maintenance of a healthful environment.

The Bureau of State Services is one of the three major divisions of the Public Health Service; the other two are the National Institutes of Health, Bethesda, Maryland, and the Bureau of Medical Services. The Bureau of State Services operates two research centers in addition to the Communicable Disease Center: the Sanitary Engineering Center, Cincinnati, Ohio, and the Arctic Health Research Center, Anchorage, Alaska.

NIH PERSONNEL CHANGES

Effective July 1 four changes were made in the Office of the Director, Dr. James A. Shannon, National Institutes of Health, Bethesda, Maryland.

Dr. Joseph E. Smadel became Chief of the Laboratory of Virology and Rickettsiology, Division of Biologics Standards.

Dr. G. Burroughs Mider, replaced Dr. Smadel in the new position of Director of Laboratories and Clinics.

Dr. Jack Masur, Director of the Clinical Center, was given additional staff responsibility for policy guidance and program planning within the Office of the Director as Associate Director for Clinical Care Administration.

Dr. Ernest M. Allen, Chief of the Division of Research Grants, was given similar additional responsibility as Associate Director for Research Grants.

Dr. Shannon, Director of NIH, said, "Dr. Smadel has desired for some time to return to the laboratory and continue his research career and I have reluctantly acceded to his request."

SALK POLIO VACCINE

Over 91 million persons in the United States have received one or more injections of the Salk polio vaccine according to estimates made by the Public Health Service. And 72 million of them have received three or more injections required for the complete vaccination. The National Foundation assisted in this survey.

However, 49 percent of the population has not received any vaccine. Among children under five years of age, who accounted for 43 percent of all paralytic polio cases in 1959, there are still 8.5 million, or 42 percent of all children in that age group, who have had less than the three or more shots required. Nineteen percent of them have had no vaccine at all. *Vaccination for polio is important.*

CANCER BOOKLET

Treating Cancer (PHS Publ. No. 690) is a 16-page pocket size booklet for the non medical audience. Single copies are available for 15¢ from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

Here are three excerpts from the booklet that may be of interest: "At the present time, surgery and radiation are the only methods of treatment that can cure cancer." "Chemotherapy probably offers the best hope in the continuing search for a means of destroying cancers that have spread beyond their original sites." "Research plays a large part in the progress we are now making in cancer treatment." These subjects are elaborated upon in individual chapters in the booklet.

A "Suggested Reading" list of books and articles is offered.

RECEIVES FULBRIGHT FELLOWSHIP

Dr. Leon Jacobs, Chief of the Laboratory of Parasitic Diseases, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland, has been awarded a Fulbright Fellowship to work at the Wallaceville Animal Research Station in collaboration with scientists of the New Zealand Department of Agriculture. Dr. Jacobs, a Commissioned Officer in the Public Health Service, will remain in New Zealand for about eight months and will study the problem of toxoplasmosis, particularly in sheep.

In addition to the Fulbright award, Dr. Jacobs has received a Guggenheim Foundation grant for $3,000. This will supplement his fellowship and permit him to return to Bethesda by way of Japan, Southeast Asia and Europe, where he plans to observe the parasitic disease problems of those lands. He will be back in the U. S. in early 1961.

LABORATORY REFRESHER COURSES

The Communicable Disease Center, Public Health Service, Atlanta, Georgia, is offering the following laboratory refresher training courses during the fiscal year, July 1960-June 1961.

Dates 1960	*Courses*	*Duration* (weeks)
Oct. 10-21	Fundamentals of Virology (819)	2
Oct. 31—Nov. 11	Laboratory Methods in the Diagnosis of Tuberculosis (855)	2
Nov. 28-Dec. 2	Laboratory Methods in the Diagnosis of Rabies (826)	1
Dec. 5-9	Bacteriophage Typing of Staphylococci (856)	1
1961		
Jan. 9-Feb. 3	Laboratory Methods in Medical Mycology (815)	4
Jan. 23-Feb. 10	Serologic Methods in Microbiology (941)	3
Jan. 30-Feb. 10	Laboratory Methods in the Diagnosis of Tuberculosis (855)	2
Feb. 13-24	Laboratory Methods in the Study of Pulmonary Mycoses (817)	2
Feb. 27-Mar. 17	Laboratory Methods in Medical Bacteriology (838)	3
Mar. 6-10	Laboratory Diagnostic Methods in Veterinary Mycology (940)	1
Mar. 13-31	Laboratory Methods in the Diagnosis of Viral and Rickettsial Diseases (820)	3
Mar. 20-24	Special Problems in Medical Bacteriology (839)	1
Mar. 27-Apr. 7	Laboratory Methods in Enteric Bacteriology (850)	2
Apr. 3-7	Laboratory Methods in the Diagnosis of Rabies (826)	1
**	Laboratory Methods in the Diagnosis of Malaria (805)	1
**	Special Training in Virus Techniques (821)	2-4
**	Typing of *Corynebacterium diphtheriae* (842)	1
**	Special Problems in Enteric Bacteriology (851)	2
**	Phage Typing of *Salmonella typhosa* (852)	1
**	Laboratory Methods in the Diagnosis of Leptospirosis (853)	1-4
**	Serologic Differentiation of Streptococci (854)	2
**	Special Problems in Microbiology (942)	1-2

** Courses given by special arrangement only.

Further information may be obtained by writing to the Communicable Disease Center, Atlanta 22, Georgia.

INTENSIVE TRAINING COURSES FOR NURSES

Twelve institutions have been granted Public Health Service funds to assist graduate nurses in short-term intensive training courses.

Since February, traineeship grants have been made to 25 institutions in 23 States sponsoring a total of 51 short-term courses. Twenty of the sponsors are university schools of nursing or public health, two are State health departments, while the other three are a general hospital and a State professional nursing organization and a regional education board.

To be eligible for Federal traineeships, candidates must be citizens of the United States, graduates of State-approved basic schools of nursing, licensed as professional nurses in a State or possession of the United States, and currently employed or committed to a position in administration, supervision, or teaching of nursing.

RETIRED

Arthur P. Miller, sanitary engineer of the Public Health Service for almost forty years retired recently. During World War I he served in France with the 312th Field Artillery, 79th Division. He resides at 5129 Worthington Drive, Washington, D.C.

Veterans Administration

Chief Medical Director—WILLIAM S. MIDDLETON, M.D.

Deputy Chief Med. Dir.—H. MARTIN ENGLE, M.D.

ASSIGNMENTS

Dr. Harry A. Kemp, who has been director of professional services at the Veterans Administration Hospital, Portland, Oregon, has been appointed manager of the VA hospital, Atlanta, Georgia. He is a graduate of St. Louis University School of Medicine and has been Dean of the College of Medicine, University of Vermont, and Ohio State University Medical School.

Dr. Ralph S. Metheny, who has been manager of the Veterans Administration hospital at Boston, has been named area medical director for the VA at St. Paul, Minn., effective August 1. He will succeed Dr. Oreon K. Timm who is being transferred to the VA Central Office in Washington.

Dr. Metheny was with the Army Medical Corps from 1933 to 1946 and attained the rank of colonel.

Miscellaneous

OCDM NATIONAL HEALTH PLAN

A National Health Plan, developed by the government with the assistance of professional health associations, has been issued by the Office of Civil and Defense Mobilization.

Issued as Annex 18 to the broader National Plan for Civil Defense and Defense Mobilization, the Health Plan outlines the areas of responsibility, organization, functions and programs for health services under national emergency conditions, including a survival and recovery period that would follow any direct attack on the United States.

In issuing the Health Annex, Director of Civil and Defense Mobilization Leo A. Hoegh said that its major premise is the responsibility of individuals and of professional associations in the health field to take an active part in civil defense and defense mobilization planning and training in their communities.

Behind the Plan are the assumptions that a nuclear attack on this country would:

1. Disrupt organized health services in many communities;

2. Cause severe shortages of health supplies, manpower, and medical facilities.

The basic principle in dealing with these problems is the responsibility of individuals and families to be self-sufficient for a limited period of time after an attack until help reaches them. Shortages must be met with conservation measures, improvisations, substitutions for supplies and methods of care,

and maximum use of auxiliary personnel.

Preparedness measures for the family include training in first aid for at least one family member, keeping immunizations current, and the maintenance of supplies of survival items in homes or shelter areas.

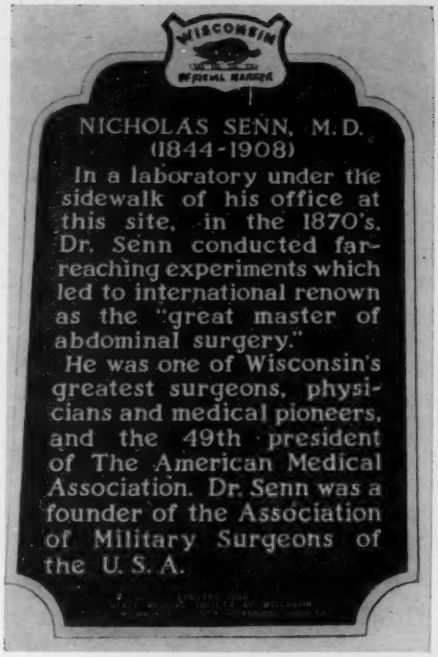
Mr. Hoegh has stressed that the Plan is essentially a guide for State and local authorities as they work out emergency health programs in their areas in cooperation with members of professional health and medical associations, the medical supply industry, business and civic organizations, and other agencies with health interests and responsibilities.

While the Plan emphasizes that Federal and State guidance is necessary and must be assured, Mr. Hoegh pointed out, it is at the local community that the success of pre-attack planning will be determined. This success is dependent on participation by members of the professions and their associations.

Under the National Health Plan responsibility for health resources acquisition, management and control rests with the Office of Civil and Defense Mobilization. The Health Services Office of OCDM, the Director of which is Dr. W. P. Dearing, provides staff services for the Director of OCDM in matters pertaining to health. Subject to the policy direction and central program control of OCDM, primary responsibility in the Federal Government for civil defense health and civilian health mobilization programs is assigned to the Department of Health, Education, and Welfare.

HISTORICAL PLAQUE FOR ASSOCIATION FOUNDER

Dr. Nicholas Senn (1844-1908), founder of the Association of Military Surgeons of the United States, a prominent surgeon in the early part of this century, a man devoted to the military medical services, and an internationally known physician, was honored on May 4 by the State Medical Society of Wisconsin when a plaque was unveiled in Milwaukee. The plaque will be located at the site of Dr. Senn's office in Milwaukee, North Third and Juneau Avenue. The building is now occupied by the West Side Bank.


WISCONSIN
NICHOLAS SENN, M.D.
(1844-1908)
In a laboratory under the sidewalk of his office at this site, in the 1870's, Dr. Senn conducted far-reaching experiments which led to international renown as the "great master of abdominal surgery."
He was one of Wisconsin's greatest surgeons, physicians and medical pioneers, and the 49th president of The American Medical Association. Dr. Senn was a founder of the Association of Military Surgeons of the U. S. A.

Those participating in the program were W. D. Stovall, M.D.; Major General George F. Lull, USA, Ret., (MC); Leslie H. Fishel, Jr., Ph.D.; Mr. Irve Zink; James M. Sullivan, M.D.; and Ulrich Senn, M.D.

In 1893, Dr. Senn moved to Chicago. He became professor of military surgery in the University of Chicago, professor of surgery in the Chicago Policlinic, and chief of surgery at St. Joseph's Hospital.

His work is well covered by the article "Nicholas Senn, Surgeon and Soldier: A Happy Combination in Military Medicine" which was writeen by Brig. General Amos R. Koontz, Maryland National Guard, and appeared in the March 1960 issue of MILITARY MEDICINE.

MEDICAL ADVISORY COMMITTEE

Dr. Howard A. Rusk, Director of the Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, has been appointed chairman of a Medical Advisory Committee in the Office of Vocational Rehabilitation (OVR), Department of Health, Education, and Welfare.

According to Miss Mary E. Switzer, Director of OVR, the committee will assist in the planning of long-range medical programs and policies related to the current and expanding State-Federal rehabilitation program; promote liaison with various medical groups throughout the country and interpret the objectives of the Office of Vocational Rehabilitation.

ANIMAL EXPERIMENTATION BILL

S.3570 was introduced in the Senate May 18, by Senator John Sherman Cooper of Kentucky "to provide for the humane treatment of animals used in experiment and tests by recipients of grants from the United States and by agencies and instrumentalities of the United States Government, and for other purposes."

This bill is co-sponsored by Senators Mansfield (Mont.), Bartlett and Gruening (Alaska), Byrd and Randolph (W.Va.), Kefauver (Tenn.), Morse (Ore.), Proxmire (Wis.), McNamara (Mich.), Clark (Pa.), and Williams (N.J.).

No grants are to be made from Federal funds unless the person who does animal experimentation (on vertebrates) has a certificate from the Department of Health, Education, and Welfare. The bill also provided for certain type of housing approved by that agency. Furthermore, reports will be required, and inspections are provided for. The penalty for failure to meet the requirements set down by the Secretary of Health, Education, and Welfare will be suspension of the projects for which the funds were granted.

Dr. Lester R. Dragstedt, President of the National Society for Medical Research, in commenting on the bill has said, "The Cooper bill has no constructive provisions. It makes no provision for helping the scientists attain better methods, better helpers or better facilities. The Cooper bill only proposes to create a cops-and-robbers game to drain away the time and resources of scientists who are trying to find better ways to save lives and alleviate suffering.

"Good care of laboratory animals is more than a matter of humanity. It is a matter of scientific accuracy and efficiency. No pet owner spends as much for special diets, medicines, equipment and professional care as is spent on test animals. This is because a stray germ or an unanticipated physical condition in a test animal can waste all of the work put into a piece of research."

Unless this bill is passed at this session of Congress the bill will have to be re-introduced in the 87th Congress which will convene in January 1961.

MEDICAL RESEARCH

Two billion dollars of Federal money a year for medical research by 1970? That may well be the figure if recommendations by several recent committees are followed. The most recent committee to testify before Congress had as its chairman, Boisfeuillet Jones; the recommendations of his committee followed along the lines of those recommendations made by committees in previous years, namely, that more money should be appropriated by the government for medical research.

When we think of the billions spent for defense, we certainly feel justified in the thought that a couple billions for our health would not be out of order. Both appropriations must come from a common source—the taxpayer. He is the one that comes in for the benefit.

We probably cannot think in terms of much increase in life expectancy but we have every right to want less morbidity during that longer life that has been provided in America since the turn of the century. There are many problems that lie before us that must be solved. Some of these have to do with the illnesses of our older age group. Undoubtedly these problems will be intensively studied in this decade.

DRUGS AND THE DRUG INDUSTRY

Dr. Jules Backman, research professor of economics at New York University, has stated that the wholesale prices of drugs have declined six percent since 1949.

Employment in drug and medicine manufacturing is 104,000 while all manufacturing employment is 16,156,000.

The total sales of drugs is $2.7 billion, an increase from the $890 million in 1947.

For better products the pharmaceutical manufacturers are spending over $100 million a year in research.

PLANE PILOT EXAMS

Physicians designated by the Federal Aviation Agency will have to do the physical examinations for Class 3 plane pilots beginning June 15.

The Civil Air Surgeon, Dr. James Goddard, will welcome applications from physicians desiring appointment and seeking to learn what the qualifications are for these designated physicians.

LIVE VIRUS POLIO VACCINE

The Russians have been using large amounts of the oral polio vaccine originally developed by Dr. Albert B. Sabin of the University of Cincinnati. By the end of 1960 it is expected that the 80 million persons in the two-months to 20-year group will have received this oral vaccine manufactured in the Moscow Institute for Poliomyelitis Research which has for its Director Prof. Mikhail P. Chumakov.

A group of American scientists that included Dr. Sabin recently visited that Institute for a conference with Russian scientists to discuss the accumulated data on the use of the Sabin vaccine. This group reports that "the Russians are completely convinced of the safety of the Sabin experimental vaccine." However, the Americans are not convinced.

In the United States investigations the oral vaccine has been given in one dose. However, in Russia a four-dose method is used, each dose at monthly intervals. This seems to give a high rate of protection.

At this conference two other oral vaccines were discussed: that developed by Dr. Herald R. Cox of Lederle Laboratories, and that of Dr. Hilary Koprowski, now of the Wistar Institute.

CANCER DIAGNOSIS

Cancer of the stomach is a difficult diagnosis to make preoperatively. However, a recent development may make the study easier and more accurate. This procedure was reported to the American Surgical Association by Dr. Norman B. Ackerman and Dr. Arthur S. McFee with Drs. Donald B. Shahon and Owen H. Wagensteen, University of Minnesota.

The method consists of having the patient take a small amount of phosphorus-32, then placing a balloon, with photographic emulsion on its inside, into the stomach, leaving it for six hours, and then removing and developing. Malignant tissue absorbs more of the phosphorus and at that site the sensitized balloon will show a darkened surface. Earlier diagnosis of cancer of the stomach should be expected by this method.

THREE-D MICROSCOPE

A microscope which gives a luminous or three-dimensional image of living cells was shown for the first time at the Instruments, Electronics and Automation Exhibition, London recently.

It is the work of a team led by Mr. Richard Gregory at the Cambridge University Psychological Laboratory.

The new microscope should prove useful for examining thick sections of suitably prepared brain tissue in order to see how the brain cells are related to each other.

SMOG

Some of the dragons breathing forth noxious gases will be equipped with masks in the next few years, in at least one State—California.

A law is now on the books of that State which will protect people from these beasts that have been belching forth their poisonous gases and polluting our air. These beasts are for the most part the motor vehicles that, for too many years now, have been uncontrolled.

NOXIOUS GAS

Nitrogen dioxide, a poisonous gas, develops in silos and the term "silo gas" has been coined. Some facts about this and about "silo filler's disease" were brought out at the recent postgraduate course at the University of Wisconsin.

Dr. Robert H. Burris, University of Wisconsin biochemist stated that some plants like corn have a great capacity for taking nitrate from the soil. The increased use of nitrogenous fertilizers in the past 20 years has probably increased the plant nitrate storage. In the silo the forage gives off nitric oxide which combines with oxygen in the air to produce nitrogen dioxide.

Dr. Leonard M. Schuman, University of Minnesota, spoke on "silo filler's disease." He said that the best protection against the disease is to stay away from the freshly-filled silos for at least three days after filling.

INVENTORS NOTE

The National Inventors Council which serves as a liaison agency between the civilian inventor and the Armed Forces, is looking for ideas for the Armed Forces.

Inventions needed to better equip the military man of today include an individual range finder for infantry troops, a substitute for sonar for the Navy, and a lightweight flight armor to protect pilots as well as ground personnel from armor piercing ammunition. Also needed is a disposable cook stove for field use that can be thrown away after the meal is heated. Any other ideas will be welcomed.

Send your ideas (fully described) to the National Inventors Council, OTS, U. S. Department of Commerce, Washington 25, D.C.

SURPLUS PROPERTY

During the first quarter of this year the Department of Health, Education. and Welfare made available surplus property valued at over $91 million. This property which included real estate no longer needed by the government was made available to educational and public health agencies and civil defense organizations of State and local governments.

SCHEDE WALKING TRICYCLE

A technical reprint, "The Three-Wheel Device (Schede Walking Tricycle) in Orthopedic Surgery" by Von Prof. Dr. Fr. Schede, is available without charge upon request to: Orthopedic Equipment Co., Bourbon, Indiana.

CHART AVAILABLE

A 12-page, profusely illustrated wall chart, 14½ × 23½ inches in size, showing and identifying all the important bones of the human body, has been produced for doctors, nurses, and instructors in professional schools. In addition to human skeleton diagrams and nomenclature, there are pages showing orthopedic equipment.

Requests for the chart should be made to Education Dep't., Orthopedic Equipment Co., Bourbon, Indiana.

HEW TRENDS BOOKLET

A 90-page booklet—*Health, Education, and Welfare Trends, 1960*—is a statistical digest dealing with the Nation's human resources. It covers such subjects as illness and medical care, educational attainment, social insurance, public assistance, and vocational rehabilitation. It is being issued, according to Secretary of Health, Education, and Welfare Arthur S. Flemming, to "chart the gains of the past and to help in understanding current and emerging problems."

Health, Education, and Welfare Trends cites such facts as these:

—For each of the past 2 years hospital construction outlays reached almost $1 billion. Four-fifths of the money was non-Federal.

—In spite of reductions in recent years there are still well over 600,000 resident patients of mental hospitals.

—All Federal grants-in-aid totaled $6.3 billion in fiscal year 1959. Grants for health, education, vocational rehabilitation, welfare, and employment security accounted for $3.5 billion of the total.

—Federal expenditures for research and development are expected to approach $7.5 billion this fiscal year. Less than 4 percent is for programs administered by the Department of Health, Education, and Welfare.

—Enrollments in elementary and secondary schools this year total 42.7 million. Eighty-five percent are in public schools.

—Public and private educational construction totaled $3.2 billion last year. During the past 12 years public school construction has accounted for 80 percent of the total.

—Over 30 percent of all persons entering the fifth grade now go on to college.

—Over 7 percent of all persons 20 years of age and over are now college graduates. Forty-two percent of those 15 and over have finished high school.

—Civilian per capita food consumption is nearly 1,500 pounds per year. Two-thirds of the total consists of dairy products and eggs; meats, fish, and poultry; and fruits and vegetables.

—Private expenditures for medical care and voluntary health insurance totals about 5 percent of disposable personal income. In 1958, per capita expenditures for medical care were nearly $96, distributed as follows: $30 for hospital services; $25 for physicians; $25 for medicines and appliances, $10 for dentists' services; and $6 for all other medical expenditures.

Copies of *Health, Education, and Welfare Trends* may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C., at 50 cents per copy.

PUBLICATIONS AVAILABLE

A Survey of Basic Research Activities in the Air Research and Development Command (PB 161291), 342 pp., price $5.00.

A Supine Seat for High Stress Testing of Primates (PB 151976), 23 pp., price 75¢.

Failure in Temperature Regulation During Progressive Dehydration (PB 161084), 32 pp., price $1.00.

Insect and Rodent Control (PB 1611357), Armed Forces, 182 pp., price $3.00.

Above may be obtained from the U. S. Department of Commerce, OTS, Washington 25, D.C.

WORLD HEALTH ORGANIZATION PUBLICATIONS

Tuberculosis Bull. Vol. 22/1-2/'60 Bull. Vol. 22/3-4/'60	(each)	$4.00
Psychopharmaceuticals Bull. Vol. 21/4-5/'59		4.00
The Work of WHO-1959 Annual Report		2.00
Bibliography on Bilharziasis (1949-1958)		2.00
Tuberculosis in Japan & Bilharziasis Bull. Vol. 21/2/'59		2.00
Diarrheal Diseases Bull. Vol. 21/3/'59		2.00
Radiochemical Analysis Methods TR 173/'59		1.00
Epidemiological Methods in Study of Mental Disorders Public Health Papers #2		1.00
Malaria Chronicle Vol. 13 (9-10) '59		.60
Hygiene & Sanitation in Aviation TR 174/'59		.60
Health Services in USSR Public Health Papers #3		.60
Psychiatric Services & Architecture Public Health Papers #1		.60
Leprosy (1948-1959) Reprint		.30
Leprosy Committee Report TR 189/'60		.30
Social Psychiatry; Community Attitudes TR 177/'59		.30
Mental Health Problems of Automation TR 183/'59		.30
Mental Disorders—Committee Report TR 185/'60		.30
Cancer of Lung TR 192/'60		.30
Requirements for Biological Substances TR 178/'59		.30

Above may be obtained from the Columbia University Press, International Documents Section, 2960 Broadway, New York 27, N.Y.

PG COURSE IN GASTROENTEROLOGY

On October 27, 28, and 29 a postgraduate course will be held at the Bellevue-Stratford

Hotel in Philadelphia, Pa., by the American College of Gastroenterology. For further information write to the College at 33 West 60th Street, New York 23, N.Y.

ALCOHOLICS ANONYMOUS

July marks the 25th Anniversary of Alcoholics Anonymous, an organization that has approximately 100,000 members who have recovered from alcoholism and who today do not use alcohol in any form. The only requirement for AA membership is a desire to stop the drinking of alcohol. A General Service Office is maintained at 141 East 44th St., New York, but there are many local groups in this country and overseas.

WORRIED

"Man, you sure look worried."

" I am. I have so many troubles that if anything happens to me today, it'll be at least two weeks before I can worry about it."

OLD AGE

Grandchildren don't make a man feel old; it's the knowledge that he's married to a grandmother. *Puck, Tit-Bits,* London.

New York Chapter

The spring meeting of the New York Chapter of the Association of Military Surgeons was held on May 19 at the Albert Einstein College of Medicine, Bronx, New York.

A well prepared scientific program preceded the dinner for 125 persons at which Colonel Wilbur A. Smith, USAFR, MC, president of the Chapter, presided.

Lt. Colonel Joseph D. Goldstein, Chief of the Department of Atomic Casualty Studies, Walter Reed Army Institute of Research, presented an illustrated talk on mass casualties. He stressed the need for community organization and training in preparation for any casualty situation whether it be one, five, a hundred, or thousands of casualties. Without organization and training there is chaos.

The next chapter meeting will be in the fall of this year.

Honor Roll

Since the publication of our last list, the following sponsored one or more applicants for membership in the Association:

Dr. Timothy Lamphier
Lt. Col. Myrtle N. Quamen, USAF (NC)
Lt. Col. Joseph Hirsh, MSC, USAR
Col. Leonard P. Zagelow, USAF, MSC
Capt. Warren S. Witus, USAF, MC
Major Edward A. Barrett, MC, USAR
Col. W. G. Kostecki, USA, MC
Lt. N. G. Skaperdas, DC, USNR
Major Robert H. Quinn
Col. Dr. Dimas Aruti
Brig. Gen. Carl W. Tempel, MC

New Members

John D. Elmore, M.D.
Silvio F. Soricelli, DDS
Captain Anna L. Hager, ANC
Lt. Norman Ronis, MC, USNR
Maj. Robert Randolph Burwell, USAF, MC
David Berman, M.D.
Lt. (jg) George F. Baker, Jr., MSC, USN
Dr. Faye G. Abdellah
Jerald L. Starkey, M.D.
Maj. Nan L. Porter USAF (NC)
Lt. Cdr. Herbert Volk, MC, USNR
Col. Robin M. Rankow, MC, USAR
Col. James A. Rooney, MSC, USAR
Dr. Irving D. Laudeutscher, USPHS
Lt. Col. Nathan Cooper, USAF, MSC
Lt. Ann Sefchok, NC, USN
Lt. Robert F. Sloan, MSC, USA
LCdr. Mary E. Price, NC, USNR
Capt. Harry G. Reid, Jr., MC, AUS
Major Wesley James Potter, USAFR, (MSC)
LCdr. Mildred E. Costello, NC, USN
Cdr. Joseph E. Eastman, Jr., MC, USNR
Capt. Morton Zuckev, USAFR, MSC
Capt. Charles A. Roche, MC, USA
Col. Dan Crozier, MC
Mr. Gerald K. Ebbeson
LCdr. Mary C. Kelly, NC, USN
Major Daniel M. Lilly, MSC, USAR
Major William P. Henderson
Brig. Gen. Gino Tovazzi, IMOS

NEW BOOKS

Books may be ordered through this association.

The Concise Encyclopedia of Modern Surgery, James Hale Rutledge, M.D. Chilton Book Division, Philadelphia 39, Pa. Price $8.00.

We'll Be Home for Christmas, Emilio Aguirre, Greenwich Book Publishers, New York 17, N.Y. Price $2.50.

The Thyroid-Vitamin Approach to Cholesterol Atheromatosis and Chronic Disease, A Monograph, Murray Israel, M.D., Vascular Research Foundation, New York 59, N.Y.

Medical, Surgical, and Gynecological Complications of Pregnancy, Staff of The Mount Sanai Hospital, New York City. The Williams & Wilkins Company, Baltimore 2, Md. Price $16.50.

Physics and Medicine of the Atmosphere and Space, Major General Otis O. Benson, Jr., and Dr. Hubertus Strughold, John Wiley & Sons, Inc., New York 16, N.Y. Price $12.50.

Pathogenesis and Treatment of Occlusive Arterial Disease. Lawson McDonald, J. P. Lippincott Co., Philadelphia, Pa. Price $5.00.

Proceedings of a Symposium on Immunization in Childhood, held in London, 1959, The Williams & Wilkins Co., Baltimore, Md. Price $4.25.

Fundamentals of Clinical Hematology, Byrd S. Leavell, M.D. and Oscar A. Thorup, Jr., M.D., W. B. Saunders Co., Philadelphia, Pa. Price $10.00.

EDEMA Mechanisms and Management, A Hahnemann Symposium on Salt and Water Retention, Edited by John H. Moyer, M.D. and Morton Fuchs, M.D., W. B. Saunders Co., Philadelphia, Pa. Price $15.00.

Surgical and Clinical Pathology in the Tropics, Charles Bowesman, O.B.E., Williams & Wilkins Company, Baltimore 2, Md. Price $22.50.

A Symposium of pH and Blood Gas Measurement, Ronald F. Woolmer, V.R.D., B.A., B.M., F.F.A.R.C.S., Little, Brown and Company, Boston, Mass. Price $8.50.

BOOK REVIEWS

THE SURGERY OF THEODORIC (about A.D. 1267). Vol. II. Translated from the Latin by Eldridge Campbell, M.D., and James Colton, M.A. 233 pp. Appleton-Century-Crofts, Inc., New York. Price $5.50.

Theodorico Borgognoni (1205-1296), Bishop of Cervia, wrote a surgical treatise in four books, which was finished about 1267. Volume II of the present work is a translation of Theodoric's Books III and IV.

Theodoric quotes "the ancients" freely. He frequently quotes Avicenna and almost as frequently Galen. He also quotes Rhazes, Albucasis, Alexander, and "Master Hugo" of Lucca (Ugo Borgognoni), who was either his father or his mentor.

Most diseases which he treats were caused by the various forms of bile—yellow, red, fiery, or black—or phlegm, or various combinations of these substances. Some conditions were caused by too frequent coitus after lunch.

Besides surgical treatment, purging, bleeding, cupping, emetics, and leeches were used freely. Elaborate diets were carefully prescribed. In many conditions coitus was to be avoided. Certain treatments were to be given only in certain phases of the moon.

In the case of infections, he cautioned against the danger of spreading—in the neck to the throat (he had probably seen cases of edema of the glottis), and in the ear to the brain (meningitis was probably not unknown to him). He stressed the importance of drainage. Bread poultices and mustard plasters were frequently advised. (There are many of us who still remember when they were used.) He often cleansed wounds with wine. He frequently speaks of "a medication which generates flesh," but is not specific as to what drug he used to stimulate granulation tissue. Cold abscesses were to be treated by "fast and thirst."

He recognized osteomyelitis and said that all the dead bone should be taken out.

He also recognized Marjolin's ulcer (not by that name, of course) and recommended excision with a cautery.

He treated blisters by evacuation of the fluid content, but was not content with that, and also used phlebotomy and a complicated ointment.

He advised that incisions be made in the natural creases of the skin but that careful account be taken "of your own strength, so that you do not cut into a nerve, or the strands of muscles, or an artery, or large veins." This admonition is completely understandable in the pre-anesthetic days when speed was of the essence.

He advised that perirectal abscesses be incised early to prevent fistulas. He distinguished between deep and superficial fistulas-in-ano and realized that the deep ones were beyond his operative sphere. For the superficial ones he used the seton, the cautery, or/and the knife, and warned against cutting the external sphincter.

For a node (ganglion) of the hand he advised striking with a cup to burst it, and then a tight bandage. (Many of us remember when a Bible was used to burst a ganglion.) He admonished that they might return. Wens were excised and if any of the wen was left "apply medication until it is corroded to its depth."

Priapism was treated with emetics (—a potent reducer!).

Mammaplasty was performed for men with large breasts.

Dropsy (ascites) was treated by paracentesis, and he cautioned not to remove too much of the fluid at once for fear of fainting and possible death.

Inguinal hernia was treated by having the assistant keep the contents reduced and then the surgeon using the cautery and going right down to the pubic bone. For patients who are afraid of "fire," he used incision and suture. He used the latter method for umbilical and ventral hernias.

Hemorrhoids were treated by excision.

He recognized that kidney stone could not be operated upon but said that "some cure all stones by administering menstrual blood in a potion. The same ones give mouse dung to drink." He operated upon bladder stone by going in between the scrotum and the anus.

The actual cautery was used as a counter irritant in both medical and surgical conditions.

For scabies and pruritis he considered ointments containing mercury and sulphur the best, and for impetigo an ointment with mercury.

He used a soporific sponge soaked in opium and other ingredients, which he applied to the nostrils of patients for operation until they fell asleep. He then claimed that the surgery could be performed without pain, and that it was necessary to waken the patient afterwards with another sponge soaked in vinegar.

There is obviously a good deal of superstition mixed up with his surgery. His prescriptions would make those who prescribe shotgun prescriptions today look like pikers. I counted 41 ingredients in one

of them. He also used many complicated lotions, stupes, plasters, and ointments. Besides containing vegetable matter and oils of all sorts, these often contained such unusual things as children's urine; hog's gall; mud; goat's bile; old goat's dung; burnt mice; fat of bear, lion, badger, wolf, and fox; pigeon dung; unslacked lime mixed with fasting spittle; rabbit's hair; burned horn of a he-goat if the patient was male or of she-goat if female; chicken dung; burned head, feet and whole skin of a hare; powdered "blood of a he-goat collected according to the doctrine of Alexander"; soot; bone marrow from hog's jaws; goat's sperm; snake syrup and flesh; mother's milk; eggs; egg and other shells; goat's liver; gall bladders of live birds of prey; burnt silk; soot from a furnace in which gold had been smelted; cow dung; pig dung; skinned cat; fox meat; snails, etc. All of these were made by a very elaborate ceremony.

AMOS R. KOONTZ, M.D.

THE YELLOW EMPEROR'S CLASSIC OF INTERNAL MEDICINE (HUANG TI NEI CHING SU WÊN). Translated from the Chinese by Ilza Veith, Ph.D. The Williams and Wilkins Co., Baltimore, 1949, 253 pp. Price not stated.

Huang Ti was the third of China's first five rulers. His *Nei Ching* was written about 2697 B.C. The Su Wén consists of conversations between the emperor and his physician, Ch'i Po. The book constitutes the basis of Chinese and Japanese orthodox medicine.

Chinese medicine is closely bound up with Taoism. Tao originally meant the "Way" and came to mean the "Right Way." The references to Tao in the book are numerous, but are generally coupled with the two component parts of the universe, Yin and Yang. There are many definitions of Yin and Yang, but in general it might be said that Yin represents eathly things and Yang heavenly things. Health and disease are closely related and dependent somewhat upon the four seasons; the sun, moon and stars; the eight winds; the five elements (water, fire, metal, wood and earth); and the five emotions (grief, fear, pity, joy and anger). Indeed, five seems to be a favorite number and many things are cataloged by fives—five spirits, five evils, five flavors, five harmful emanations, five exertions, etc.

It is obvious that Huang Ti's knowledge of anatomy and physiology was, to say the least, crude and primitive, and that his knowledge of pathology was practically nil.

Diagnosis was made almost entirely by examination of the pulse. The theory of the pulse was based on the various stages of interaction between Yin and Yang. The complexion and color of the skin (red, yellow, green, white and black—the five colors) were also taken into consideration.

The principle methods of treatment were by acupuncture and moxibustion. Acupuncture or "needling" consisted of the insertion of needles of various materials and shapes into particular points of the body. Nine kinds of needles are mentioned—arrow-headed, blunt, puncturing, spear-pointed, ensiform, round, capillary, long and great. Their length varied from 3 to 24 cm. They were made of flint, gold, silver, steel, or iron. When acupuncture was applied, evil influences departed. Elaborate charts showed the points of application all over the body. As many as 59 punctures were often made at one time. The time of application depended upon the sun, moon, stars, and the four seasons, as well as the eight winds.

Moxibustion consisted of the application to the skin of combustible cones of powdered leaves of Artemisia vulgaris. The cones were placed on the skin and ignited. They were extinguished only after they had burned down to the skin and a blister had formed. There were also moxibustion charts. Moxi was sometimes applies to the acupuncture points after the needle had been withdrawn.

Hot water, soups, liquid medicines, lees of wines, and sweet wine were also used. The five flavors (acid, salt, sweet, bitter and pungent) were each used for particular conditions.

Orthodox Chinese medicine including acupuncture and moxibustion have survived to the present day both in China and Japan. The orthodox medical practices have continued to exist side by side with Western medicine. One reason for this is probably the fact that in both countries orthodox medicine is so closely connected with religion. When Buddhism was introduced into Japan in the 6th century, Chinese medicine was introduced along with it.

The *Nei Ching* brings out the fact that keeping people well was an early function of the Chinese physician. It states that the superior physician helps before the disease starts, the inferior physician begings to help when the disease is already developed.

AMOS R. KOONTZ, M.D.

THE GREAT PULSE. Japanese Midwifery and Obstetrics Through the Ages. By Mary W. Standlee 192 pp., illustrated. Charles E. Tuttle Company, Rutland, Vt. (USA) and Tokyo, Japan. Price $4.50.

The author, wife of a physician, spent several years with her husband in Japan and made contacts that were invaluable for the collection of the material in this book.

As early as A.D. 772, we learn that the Japanese instructed in midwifery and the midwife spent seven years in training. The midwife still occupies an important place in Japanese medicine even though obstetrics is a specialty in the practice of medicine.

In what country has not superstition been associated with pregnancy and childbirth? Japan has been no different except that the superstitions took

on an oriental hue. We find them most interestingly recorded by the author.

The Japanese gravida, whether consciously or unconsciously knows of natural childbirth. But stoicism is a trait of the Japanese—so why shouldn't we expect it at childbirth?

In Japan the mother's life is all important. This has been the philosophy for ages. Abortion is even legalized, which surprises us Westerners.

The illustrations, of which the book has many, are extremely interesting. They are the old as well as the new. Instruments and procedures are shown.

The Great Pulse is a fascinating and informative book on childbirth in Japan through the ages.

R. E. Bitner, M.D.

Kate: The Journal of a Confederate Nurse. By Kate Cummings; edited by Richard Barksdale Harwell. 321 pp., illust. Louisiana State University Press, Baton Rouge. Price $6.00.

This book gives an excellent account of an important and relatively obscure phase of the Confederate Medical Service. Miss Cummings was one of the first women who volunteered her services to the care of the wounded soldiers of the Confederate Army and she was one of the last to return home after the war. She traveled over a wide area of the Confederacy and kept a day by day diary of the events and progress of the war. She gives an excellent description of hospital buildings, medical personnel, hospital life, and the system of mobile hospitals that was developed to make it possible for patients to be moved rapidly.

Even though Miss Cummings did not receive any type of training as a nurse she had an insight into many problems of the medical service and the needs of the patients. She and other women volunteers were constantly striving to improve the care of patients. These volunteers felt that the proper diet was very important to hasten the patient's recovery. These women worked under the supervision of the male nurses who were assigned to care for the patients. At first the doctors objected to having women in the hospitals, and it took about one and one-half years before they recognized the desirability of women as regular members of the medical service.

Because of the general feeling of the Southerners that a hospital was no place for a refined lady, the Confederate Medical Service had difficulty in getting women to help in the hospitals. Those on duty had to work long hours, and their duties included obtaining enough food to feed the patients. In many areas food was scarce, and what was available was expensive and out of the range of available hospital funds.

Miss Cummings' manuscript was first published in 1866; its present price on the rare-book market prohibits its availability to the general public. Mr. Harwell has edited it for presentation to a new and wider audience. This book is definitely worth the attention of nurses, both student and graduates. It covers a phase of nursing that is rarely if ever, included in history of nursing texts.

Lt. Col. Ethel R. Kovach, USAF, NC.

Modern Nutrition in Health and Disease. 2nd Ed. Edited by Michael G. Wohl, M.D., and Robert S. Goodhart, M.D.; 59 contributors. 1152 pp., illustrated. Lea & Febiger, Philadelphia. Price $18.50.

This excellent volume, devoted to the field of dietotherapy, is the combined work of fifty-nine contributors, each an expert in his respective subject. The text is a significant contribution to the science of nutrition and should provide an excellent addition to the library of physicians who are faced with innumerable cases in which dietary control is a vital part of therapy.

The book is divided into three sections devoted to normal nutrition, nutrition in disease, and nutrition in periods of physiological stress. The first chapter appropriately covers body weight, body composition, and caloric status and indicates some of the difficulties involved in establishing a guide to "normal weight." Brief consideration is given to subjects such as the hormonal control of metabolism, physiology of the gastro-intestinal tract, and psychology and physiology of appetite. Readers with special interest in these areas will find only a cursory review of the subjects; however, these chapters are well documented with references which provide a basis for further study by those so inclined.

The primary dietary factors, protein, carbohydrate, and fats are each discussed in terms of chemistry, sources, absorption, digestion and metabolism, storage, and effects of deficiency. In regard to the mineral elements, greater emphasis is given to those having known clinical implications, such as calcium, iron, copper, cobalt, and fluorine. Iodine and its relationship to thyroid function is discussed in a separate chapter.

Vitamin A absorption, transport, storage, function, etc., are considered in some detail and while briefer descriptions are given of vitamins D, E, and K, adequate references are provided for further reading. Thiamine, riboflavin, niacin, pantothenic acid pyridoxine, folic acid, vitamin B_{12}, and vitamin C are each discussed with reference to discovery, function, deficiency syndrome, requirement, and sources. In addition to the chapters on the fundamental nutritional factors, discussions are presented on fluid and electrolyte balance, antimetabolites, and dietary interrelationships. Public Health workers will be particularly interested in the chapter on chemical and other additives to food.

The evaluation of malnutrition is made difficult by the many interrelationships and multiple deficiencies which may exist in subjects. For this reason

the section of laboratory aids in the diagnosis of malnutrition, both biochemical and roentgenologic, will be useful.

Part II—Nutrition in Disease—provides practical information about the implementation of the basic nutritional data supplied in the earlier chapters. Diseases of the stomach, intestinal tract, liver, biliary tract, kidney and urogenital tract are all discussed in some detail and dietary management with specific diets suggested in each situation. Atherosclerosis is reviewed very well and information provided concerning the chemistry of the disease and relationship to unsaturated fatty acids. About 300 references are appended to this chapter alone.

Discussions of nutrition in allergics, rheumatism, arthritis and gout, diseases of the skin, obesity and undernutrition provide current information pertinent to the management of these conditions.

Part III of this volume is devoted to nutrition in periods of physiological stress, such as pregnancy, infancy, adolescence, old age, as well as under environmental stresses.

This unusually comprehensive volume skillfully combines the basic information of nutrition with the management of diseases which require special dietary control. The text will be a valuable source of information for physicians, dieticians, and public health workers in fields where nutrition is of importance.

ROBERT VAN REEN, Ph.D.

MANUAL OF SKIN DISEASES. By Gordon C. Sauer, M.D. 269 pp., 151 illust., 28 color plates. J. B. Lippincott Company, Philadelphia and Montreal. Price $9.75.

On rare occasions this reviewer comes across a book so original in conception as to inspire the devout sentiment: "Wish I had this when I went to medical school". Dr. Sauer's slim volume glides with ease onto this imaginary bookshelf. Written at the direct challenge of a senior student for a "concise and factual" text in dermatology, the author has done a really remarkable job of presenting an obscure subject in a manner which is at once rational, interesting, and quite stimulating.

The crux of dermatology is correct diagnosis. Without this, treatment is at best haphazard, and may prove downright dangerous. Most of the cases referred to the dermatologist have had the dubious benefit of brash preliminary care. Any general practitioner who will read the chapter on diagnosis should be able to avoid many a pitfall. Here as well as throughout the book emphasis is constantly and correctly placed on the importance of distribution and location. Black and white photographs of uniform excellence in juxtaposition with schematic drawings of the characteristic grouping of lesions reveal all that is required for recognizing the common dermatoses. An additional twenty-eight plates in color from a valuable atlas in themselves.

Dr. Sauer is evidently a "natural" when it comes to teaching. Having led the student to the correct diagnosis he follows through with much sensible and lucid advice on the delicate art of therapy. Cases are discussed as one might meet them in the office, and the ever-threatening complications from overtreatment are anticipated and guarded against.

Even the dictionary-index is noteworthy since it includes a resumé of rarer entities which have only casual interest for the beginner. All in all this is an expertly planned approach to dermatology, well-deserving of the great success I predict for it.

LT. COL. MORRIS H. SAFFRON, USAR, RET.

ANTITHROMBOTIC THERAPY. A Monograph. By Paul W. Boyles, M.D. 131 pp., illust. Grune & Stratton, New York and London. Price $5.00.

The author has briefly and concisely outlined and discussed both the normal mechanisms of blood coagulation and the coagulation defects produced by antithrombotic therapy. He brings together in a simplified manner the many synonyms used in the literature and catalogs them in their proper place by appropriate tables.

The different anticoagulant drugs and their clinical uses are described. Thrombolytic therapy is discussed and the hope raised that suitable material of clinical usefulness may soon be developed which will improve the present day management of thrombotic disease.

The bibliography contains 283 references and the 30-page addendum describes the various test methods which have been found most satisfactory in studying blood coagulation defects.

This monograph should prove to be a useful review for those physicians and students interested in this subject.

COL. D. O. LYNN, MC, USA.

THE MEGALOBLASTIC ANEMIAS. By Victor Herbert, M.D. 162 pp. Grune & Stratton, New York and London. Price $6.00.

This is a brief, well-balanced treatment of the subject. Using the available wealth of information concerning folic acid metabolism and the movements of vitamin B_{12} in the body, Dr. Herbert has prepared a detailed consideration of etiology and pathogenesis of the megaloblastic anemias. His discussion of clinical picture, diagnosis and treatment is intelligent and well-informed.

COL. W. H. CROSBY, MC, USA.

LEUKOCYTE ANTIGENS AND ANTIBODIES. By Roy L. Walford, M.D. 182 pp. Grune & Stratton, Inc., New York and London. Price $6.75.

Leukocyte antibodies are causing more and more trouble: drug-induced leukopenias and agranulocy-

tosis, autoimmune neutropenia, febrile transfusion reactions and the LE phenomenon are some of them. This book provides a competent summary of the matter. It gives a commendable emphasis on methods and their difficulties, as one would expect from an author with Dr. Walford's knowledge and experience. The book accurately conveys the complexity of the field and the spottiness of our knowledge. One cannot escape a suspicion that matters will probably get worse before they begin to get better.

COL. WILLIAM H. CROSBY, MC, USA.

SAFE HANDLING OF RADIOACTIVE ISOTOPES IN MEDICAL PRACTICE. By Edith H. Quimby, Sc.D., Columbia University. 129 pp. The Macmillan Company, New York. Price $4.50.

In this small but excellent text Dr. Quimby approaches and solves many of the problems associated with the handling of radioactive isotopes. After several short chapters which only acknowledge the complexities of nuclear physics, radioactivity and the medical uses of radioisotopes she considers in detail the "hot laboratory", the patient containing radioactive material, contamination and waste disposal. She offers specific advice on how to organize a "hot laboratory" (Chapter V), which I consider essential to anyone interested in establishing a laboratory using radioactive isotopes. The comments concerning methods of patient injection, doses to be expected to the nursing staff from such patients, etc., are of extreme practical value. A series of eight appendices give useful reference data that can serve as guides for establishing safe operating procedures.

All individuals who work with radioactive isotopes, including nonmedical users, would do well to check their facilities and procedures against the author's recommendations. Adherence to them will undoubtedly accomplish the stated intent of this text.

MAJOR M. P. DACQUISTO, MC, USA.

CLINICAL AUSCULTATION OF THE HEART. 2nd Ed. By Samuel A. Levine, M.D., Sc.D. (Hon.), F.A.C.P.; and W. Proctor Harvey, M.D. 657 pp., 660 illustrations. W. B. Saunders Company, Philadelphia and London. Price $11.00.

The authors are eminently well qualified to present the subject matter of this book. It is well organized, clear, and concisely written, with numerous illustrations of sound tracings which are discussed in the text. They cover basic fundamentals of examining the patient and the proper use of the stethoscope.

The book is divided into four chapters under the headings of Heart Sounds, Cardiac Irregularities, Cardiac Murmurs, and Miscellaneous Auscultatory Findings. In this manner the significance of heart sounds are discussed, including the intensity, splitting, and the significance of extra or multiple heart sounds. In the chapter under Cardiac Murmurs, both valvular heart disease and congenital heart disease are covered from an over-all clinical standpoint as well as by auscultation. Under the chapter, Miscellaneous Auscultatory Findings, various subjects such as pericarditis, arteriovenous fistulae, traumatic heart disease, aortic aneurysms, myocarditis, and other cardiovascular conditions are discussed.

The ten years between the first and second editions have been filled with many advances in new knowledge and new technics in the field of cardiovascular diseases. The different characteristics of cardiovascular sounds and their importance in the evaluation of patients is now more appreciated than ever before. This book admirably covers the field of cardiac sounds with representative phonocardiograms and appropriate discussion of each type of disease or abnormalities which produce certain characteristic sounds. Congenital heart disease is covered in an excellent fashion. The proper significance of splitting of the first and second heart sounds and an explanation of third sounds, and the opening snap and gallop rhythm is given in a clear and simple manner.

This book is considered to be an excellent reference for physicians and students interested in this subject.

COL. D. O. LYNN, MC, USA.

DRUGS OF CHOICE. Walter Modell, M.D., Editor; 47 contributors. 958 pp. The C. V. Mosby Company, St. Louis. Price $13.50.

This book has 42 chapters dealing with the choice of drugs for specific clinical situations. The 37 contributors are well known authors in their respective fields. Each chapter deals with a separate clinical condition as an independent subject. Some drugs are discussed in more detail in one chapter and only mentioned in others; therefore, the reader may have to search in more than one place for desired information. The different conditions covered as to choice of drugs have been well selected. The following are mentioned as examples: Diuretics, antibacterial agents, gastroenterologic disorders, sedatives, and tranquilizers in general practice and also for psychiatric disorders. They also include the choice of drugs for the arthritides, hypertension, heart disease, allergic states and urological disorders, and many others.

The concept on which this book is based is a logical and beneficial one. A revised edition is to be published every two years, which will keep the information up to date, and still give the author time to evaluate new drugs.

One of the outstanding features of this book is the manner in which drugs of a certain type that have a specific action are discussed in comparison with each other. Each drug is presented in enough detail and with the advantages and disadvantages considered to its use. Each author explains why in

his opinion one particular drug is the drug of choice in the clinical condition under discussion.

This book should prove an excellent reference for up-to-date information, especially of the various new drugs that are being released for sale by the pharmaceutical companies. These drugs are compared to one another and opinions given as to the drugs of choice for specific situations. There is a drug index listing all drugs usually by their trade name that are discussed in the text. While the text is not encyclopedic and does not include every new drug, it is sufficiently comprehensive to be of excellent value.

COL. D. O. LYNN, MC, USA.

APPLIED PHARMACOLOGY (Clark). 9th Ed. By Andrew Wilson, M.D., Ph.D., F.R.F.P.S., and H. O. Schild, M.D., Ph.D., D.Sc. 750 pp., illustrated. Little, Brown and Company, Boston. Price $10.00.

The first edition of Clark appeared in 1923; subsequent editions have been translated into Spanish and Chinese. The original intent was to close the gap between "the science of pharmacology and the art of therapeutics". That the ninth edition has been published shows that it has been successful in this attempt.

If it is not possible for a student to study in the United Kingdom, this book makes it feasible to learn of the thinking there, and the results of laboratory and clinical observations. Pharmacology is based on findings in laboratory animals; because of the laws in the United Kingdom, most of the laboratory work is conducted on frogs and rabbits which differ greatly in response from laboratory animals commonly used in the United States, or from clinical responses anyplace in the world.

Clark was a pioneer in studying the mechanism or mode of action of drugs on cells, and his thinking has been continued in this present edition. Information on general responses to drugs is followed by discussions of effects on various portions of the nervous system; then the circulation, respiration, alimentary canal and endocrine system. This is followed by considerations of antisepsis and of anthelmintic action. Each of the 34 chapters is complete within itself, presenting a brief summary of basic physiology, a comprehensive discussion of the drugs falling in the scope of each chapter, and closing with a list of the preparations official in B.P., U.S.P., B.P.C. or B.N.F. References to general literature dealing with the chapter are then presented, references extending into 1958.

The 165 figures are quite pertinent in emphasizing points discussed in the text. Structural formulae of organic compounds are presented which aid in following the text. Some confusion may develop at times, when the titles used in U.K. differ from the conventional titles for drugs in the United States. The book is well bound and has a 30-page index which proves helpful. This can be highly recommended as a reference book.

JAMES C. MUNCH

L'ÉLECTRORÉTINOGRAPHIE DYNAMIQUE EN OPHTALMOLOGIE. By G. E. Jayle, R. L. Boyer and R. L. Camo, Faculty of Marseille. 162 pp., illust. Masson & Cie, Paris. Price NF 26,00.

This is one of the best textbooks on electroretinography written in any language. It is divided into an introduction and five chapters. The introduction deals with the work of the pioneers in this field of retinal investigation. Among those mentioned the names of Karpe, Dollfus, Burian, Armington, Franceschetti, and Francois appear prominently. Karpe's method is described for use of the electroretinogram.

The first chapter describes the principle of electroretinography, its instrumentation, and the technique of registration and its interpretation. Variations in ocular conditions, in the qualities of stimulus, and in the corneal electrode are discussed. The different results in glaucoma, cataract, uveitis, retinal conditions, choroidal changes in high myopia, and in siderosis of the eye are described. Scholarly work with vascular disturbances of the retina is related. This includes hypertensive, obliterative, periphlebitic, diabetic, angiospastic and toxic retinopathy. The degenerations are described in the same manner and include retinitis pigmentosa, retinitis punctata albescens, the heredo-familial degenerations, and optic atrophy. Chapter two deals with the techniques and with instrumentation in all its details. Chapter three deals with the normal subject, and chapter four with the pathological eye. Chapter five discusses the correlation of the retina with the visual cortex. Another splendid feature of this book is the lengthy bibliography that contains almost everything that has been written on this fascinating subject. A few of the authors mentioned include Dodt, Heck, Henkes, Jacobson, Monnier, Rendahl, Riggs, Vanysek, and Zetterstrom. The authors are commended for this excellent textbook.

COL. ROLAND I. PRITIKIN, MC, USAR.

ROENTGENOLOGIC DIAGNOSIS IN OPHTHALMOLOGY. By Edward Hartmann, M.D., and Evelyn Gilles, M.D., Paris. Translated by George Z. Carter, M.D. 375 pp., illust. J. B. Lippincott Company, Philadelphia and Montreal. Price $15.00.

The liason between ophthalmology and outer specialties such as neurosurgery, neurology, pediatrics, and internal medicine is cemented by many books which define techniques available to resolve mutual problems. However, the bond between the ophthalmologist and the roentgenologist although firmly established in clinical practice is represented by only few worthwhile texts which clarify for the ophthalmologist the special techniques of the roentgenolo-

gist that are often of greatest help in ocular problems.

The present work is a French product, translated by George Z. Carter, edited by Conrad Berens, and realizes its objective to be a practical reference for the ophthalmologist and roentgenologist alike in solving basic problems encompassed by these two specialties.

The x-ray techniques, tomography, and stereoscopic roentgenography of the normal and anomalous of the walls of the orbit, optic canal, superior and inferior orbital fissures, fractures and tumors of the orbit, lacrimal passages, paranasal sinuses, periapical dental lesions, the petrous bone, sella turcica, cranial vault, and the detection and localization of intraocular foreign bodies are clearly presented in a condensed, straightforward manner.

The material is illustrated by approximately 500 photos of x-ray films, many of these are further clarified by labelled diagrams. The book is a handy reference in which the ophthalmologist will find the limitations, advantages, and recommended x-ray views for the various orbital problems encountered in his practise.

The binding and paper of the text is superior in quality. This is a recommended addition to the ophthalmologist's library.

CAPT. R. P. NADBATH, MC, USN.

PHYSIOLOGY OF THE EYE. 3rd Ed. By Francis Heed Adler, M.D., F.A.C.S. 790 pp., illust. The C. V. Mosby Co., St. Louis. Price $16.00.

This is the third edition of one of the finer books on ocular physiology. It is written with directness and clarity. The more complex aspects of ocular physiology are presented with evident effort at simplicity and statement of essentials. The review of significant research is concise and pointed in conclusion.

Corneal permeability, aqueous humor formation, phyisology of the retina, dynamics of ocular circulation, and neurology of the visual pathway are some of the subjects discussed. The section on electromyography is especially interesting. The chapter on ocular motility is particularly worth-while. The neurohumoral theory is very well presented. Binocular vision is more extensively discussed in this issue than in previous editions. There is much information for clinical application and much that will assist the reader in the better understanding of ocular disease processes.

The author has done a beautiful job. The book is highly recommended by this reviewer.

CAPT. RUDOLPH P. NADBATH, MC, USN.

OCULAR VERTICAL DEVIATIONS AND THE TREATMENT OF NYSTAGMUS. 2nd Ed. By J. Ringland Anderson, M.D., F.R.A.C.S. 189 pp., illust. J. B. Lippincott Company, Philadelphia and Montreal. Price $8.50.

This textbook describes the various defects of the muscles that move the eyeball vertically. The horizontal deviations are mentioned only as they occur in conjunction with vertical deviations. Nystagmus until recent years was considered incurable. The treatment of nystagmus is a relatively new subject and is discussed with great ability. The outstanding feature of this splendid textbook is the discussion of vertical deviations and the treatment of nystagmus from the standpoint of the evolutionary history of our knowledge of these difficult subjects. Mention is made of all the outstanding investigators of these subjects. They are: Adler, Berens, Bielschowsky, Burian, Dunnington, Fink, Friedenwald, Guibor, Kestenbaum, Lebensohn, Lyle, Urist, Verhoeff, White, and many others. The author explains the types and causes of vertical deviations, and palsies of the vertical-movement-ocular-muscles. He compares the results of his investigations of vertical deviations with those of other writers on this subject. The surgical treatment of the oblique muscles and the prognosis is analyzed.

In his chapter on the treatment of congenital nystagmus, the etiology of eccentric fixation and gaze nystagmus is progressively developed. The principles of Kestenbaum viz. that "if vision is improved by the face, head, or eye rotation to one side, then the eyes should be rotated surgically to that side" are explained. This reduces the nystagmus and improves vision.

Doctor Anderson concludes that the presence of an anomaly of one of the vertically acting muscles, and particularly of an overacting inferior oblique, is much more frequent than usually believed. Inaccurate and incomplete observations are the main causes of divergence in the views of various authors. Nystagmus should not be considered a fixed and unalterable disorder. Much may be done to lessen this disability. The use of prisms and surgery are of great value in carefully selected patients with an eccentric position of rest.

This is a well written book and consolidates all of our recent information in this domain of ophthalmology.

COL. ROLAND I. PRITIKIN, MC, USAR.

CLINICAL ORTHOPAEDICS. No. 15. The Hand—Part II. Editor-in Chief, Anthony F. DePalma, M.D., 24 contributors. 217 pp., illust. J. B. Lippincott Company, Philadelphia and Montreal. Price $7.50.

This new volume presents a well-edited series of orthopaedic topics, and contains Part II of a *collection of articles on the hand.* Nearly three-fourths of the pages are devoted to the hand. They are contemporary articles, reflecting current views by competent men who are recognized as authorities. None

of the articles is all-inclusive nor comparable, for example, to "Infections of the Hand" by Dr. Allen B. Kanavel, who is honored by a biographical sketch at the beginning of this book. The authors do write clearly, take a positive stand, and impart knowledge in a concise manner. Dr. Lot Howard's "Dupuytren's Contracture; a Guide for Management" typifies the excellence of these articles as well as of the art of line drawings.

The second section deals with other orthopaedic topics, including The Carpal Tunnel Syndrome (which might have been included under the section on The Hand); Treatment of Slipped Femoral Epiphyses with Mild Displacement and Internal Fixation in Situ; Bilateral Anterior Fasciotomy for the Correction of Persistent Lordosis in Children; Fracture-Dislocations of the Wrist, which gave an excellent description of motion and forces leading to the fractures and dislocations; The No-Name and No-Fame Bursa; Congenital Absence of Femur and Fibula; and Spondylolysis Following Spinal Fusion.

The value of this volume is greatly enhanced by the clarity with which the articles are written and also by the selection of recognized authorities who wrote them. There is a unity of writing made possible by the work of a fine panel of editors. Good print, excellent illustrations, and pleasant reading characterize this monograph which is highly recommended to all who treat orthopaedic patients.

COMMANDER ROBERT H. BROWN, MC, USN.

FUNCTIONAL ANATOMY OF THE LIMBS AND BACK. 2nd E. By W. Henry Hollinshead, Ph.D., Mayo Clinic. 403 pp., illustrated. W. B. Saunders Company, Philadelphia and London. Price $9.00.

This is a textbook for students of Physical Therapy and others interested in the locomotor apparatus. This is a second edition of a book of basic descriptive anatomy of the limbs and trunk. It is divided into five sections: (1) The Organization of the Body (2) The Upper Limb (3) The Back (4) The Lower Limb (5) The Head, Neck and Trunk.

Except for a short chapter on tissues it is all descriptive gross anatomy. As noted from the outline there is, for completeness, a section on the head, neck and trunk. The emphasis throughout, however, is on the musculo-skeletal system. Locomotor function is stressed and thus the innervation and action of all muscles is included directly with the anatomical description.

Along with explaining the function of each part described, the book is spiced with tid-bits of clinical information about the most common diseases or abnormalities of any given part for which physical therapy might be helpful. It is written in a manner to facilitate the study of gross specimens by dissection in the laboratory.

This second edition retains the general organization of the first edition but is improved in the following ways: Chapters are increased from 22 to 23 by adding one on "The Buttock and Posterior Thigh." Figures are increased from 122 to 159. A section on Synonyms is added at the end.

The terminology is based on the N.A. (nomina anatomica) of 1955 and the changes from the B.N.A. are noticeable to the older graduate.

The descriptions are lucid. Figures are all pen sketches as diagrams and these are placed conveniently near the pertinent descriptions.

Binding and printing are of excellent quality. Typographical and technical errors have been kept to a surprisingly bare minimum.

This book should be especially valuable to student and graduate physical therapists as well as to other para medical specialists such as nurses, x-ray technicians, and occupational therapists.

Outline tables of origin, innervation and action of functional muscle groups make this a useful, ready reference for physicians especially interested in the musculo-skeletal system.

LT. COL. W. H. MOORE, MC, USA.

THE SURGICAL TREATMENT OF FACIAL INJURIES. 2nd Ed. By Varaztad H. Kazanjian, M.D., D.M.D. and John M. Converse, M.D. 1110 pp., 1155 illustrations. The Williams and Wilkins Company, Baltimore. Price $22.00.

The present volume is a much expanded edition, having almost twice the page content of the first edition. This is due to the addition of six new chapters and enlargement of many of the old chapters, chiefly those dealing with the reconstructive problem.

The first four chapters deal with anatomy of the face and fundamental surgical principles, with emphasis on relationship to facial injury.

The next nine chapters are devoted to extensive coverage of facial fractures and their treatment. Four of the new chapters have been added to this section, two of which are especially worth while, namely, "Facial Injuries in Children," and "Roentgen Examination of the Facial Bones."

The remaining seventeen chapters deal with the reconstructive phase of treatment and two new chapters have been included here. This portion of the work is largely responsible for the increased size, since the chapters on the orbit, nose, jaws, and facial paralysis have been considerably enlarged. A chapter on anesthesia, included in the first edition, has been omitted without detriment to the book.

From experience gained over a period of many years and from a wealth of clinical material, the authors present a volume that is very comprehensive in its treatment of facial injury. It is well organized and written, the illustrations especially are excellent, and the case references are clear. This

volume is highly recommended to the plastic surgeon and those in kindred specialties.

J.R.C.

TEXTBOOK OF OTOLARYNGOLOGY. By David D. DeWeese, M.D., and William H. Saunders, M.D. 464 pp., 354 illustrations. The C. V. Mosby Company, St. Louis. Price $8.75.

This volume presents the best photographs of any textbook of otolaryngology that the reviewer has seen recently. Considering the fact that the book is intended for the medical student and the general practitioner, it is in many respects far superior to some of the standard texts for specialists only.

The traditional subjects are covered, but in addition the chapter on speech disorders covers a subject that is not discussed very often in the usual text. Another excellent chapter deals with the rehabilitation of persons with hearing loss. Another innovation is a complete chapter devoted to the facial nerve. Since all otologists fear complications to this important structure, it is proper to give it the respect it deserves.

The newer methods of stapes mobilization and fenestration surgery are well discussed. They are accompanied, as are all the subjects, by excellent photographs and drawings. Modern therapy is included in all topics and there is a list of selected reading at the end of each chapter for those who wish to pursue the subject in depth.

PHILIP H. SMITH, M.D.

BEHAVIORAL CHANGE IN THE CLINIC—A Systematic Approach. By Gerald R. Pascal, Ph.D. 128 pp. Grune & Stratton, New York and London. Price $4.75.

This book represents an "attempt to apply scientific method to the problem of changing gross human behavior." It purports to be a bridge between general theoretic "laws" and applied clinical treatment. The human being is conceived as located on a continuum with lower animals and the author feels that systematic principles of "psychotherapy" should have logical extension to animals lower on the phylogenetic scale of development. Laboratory derived principles of stimulus-response (behavioristic) psychology are applied only after thorough study of the stimulus and the status of the patient in regard to the stimulus. Much detailed knowledge is required about the patient and the varied stimulus-response relationships of his past history. These are then summarized into "hypothetical constructs" borrowed freely from the writings of Tolman, Freud, Hull, Maslow, Sullivan, Lewin and Menninger. The author warns the reader that the selection of such constructs is based on a priori assumptions concerning *which stimulus-response relationships will be principally responsible for later deviant behavior.* Independent variables then can be manipulated in order to reduce what is termed psychological deficit. These manipulations are formulated as a series of clearly interpreted equations which actually tend to clarify the discussion.

The author is to be congratulated for his clear expository style of writing, minimum jargon and coining of terms, and ability to present his arguments in an easily digestible number of pages. He seems to rise above slavish application of experimental methodology of the physical sciences, utilizing theory based on empirical observations and focusing on the complex behavior of human beings rather than the simple reactions of the lower orders.

The book's formulations can serve as a guide for the future experimentation and conceptualization of those holding different theoretical persuasions. It is recommended as mental invigoration for psychologists, psychiatrists and any individual interested in basic research or clinical understanding of behavior disorders.

THEODORE H. WOHL, PH.D.